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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—January, 1940.

Wheat breeders working in the field.

Wheat Breeding

Progress and Development

By Alan R. Raw, M.Agr. Sc., Cereal Geneticist

AT the beginning of this century the wheat variety, Federation was introduced into general cultivation in Australia. The production of this variety marked the successful culmination of many years of patient effort on the part of Australia's pioneer wheat breeder, the late William Farrer, and must be regarded as an achievement unparalleled in the annals of plant breeding. Coming at a time when the expansion of the wheat industry of the country was threatened by the lack of varieties suited to cultivation under arid conditions, the introduction of Federation enabled the limits of cultivation to be pushed further and further into the lower rainfall areas.

So great was the ability of this variety to adapt itself to successful cultivation over an extraordinarily wide range of conditions, that it rapidly became the most extensively grown wheat in Australia, a position which it maintained for

more than two decades, before being displaced by superior varieties produced by the breeders of a later generation. It is certain that the introduction of Federation meant a gain of millions of pounds to the farming community, and to Australia, during the first quarter of this century, and it is doubtful whether the production of any other wheat variety has exerted a more profound influence upon the development of the industry in any country of the world.

A scheme of wheat improvement by plant breeding, was inaugurated in Victoria in 1914, and for the past quarter of a century breeders of the Department of Agriculture have been striving to produce superior varieties of wheat which will outyield the old favourite Federation. In this regard, remarkable success has been achieved, and today almost two and a half million acres in Victoria, representing 80 per cent. of the total wheat area, are sown with wheats bred by the Department of Agriculture at the State Research Farm, Werribee.

The first outstanding success was the production of the variety, Free Gallipoli which displaced Federation from its premier position in 1930. Five years later, Free Gallipoli was itself displaced by a second departmental production, Ghurka, which is today the most popular variety, occupying an area of almost one and a half million acres, representing 48 per cent. of the State total. The displacement of Free Gallipoli as the most extensively grown variety was in a large part due to the inferior milling and baking quality of the grain which it produced, but in this regard it must be remembered that in the initial stages of any wheat-breeding scheme, primary attention must be devoted to improvement in yielding ability, to be followed, at a later stage, by improvement in such characters as grain quality and resistance to disease. Particularly is this the case in countries in which wheat is bought and sold on an F.A.Q. basis, irrespective of the milling and baking quality of the grain.

Today, the two most extensively grown wheats in Victoria are Ghurka and Ranee, both of which are definitely superior to Free Gallipoli in yield and grain quality. Ghurka is recommended for general cultivation throughout the State, while Ranee, on account of its earliness of maturity, is particularly suited to cultivation in the drier areas of the Mallee. The latest departmental production, Regalia, is also an early maturing variety, which has proved its superiority under Mallee conditions. On a conservative estimate the introduction of these varieties means a definite nett gain to the Victorian farmer of £750,000 per annum, thus demonstrating the value of the activities of this branch of the Department of Agriculture.

The variety Regalia which has proved satisfactory under Mallee conditions.

The work of improvement is still being continued, and at the present time a number of new crossbred wheats is undergoing final yield trials in the departmental plots which are located in the various wheat-growing areas of the State. These new crossbreds include forms which are superior in yielding ability, in the milling quality of the grain which they produce, and in their ability to resist the attacks of the various diseases to which the wheat plant is prone.

Until 1932, the cereal breeding activities of the Department were confined to the State Research Farm, at Werribee, but in recent years they have been extended and intensified. Subsidiary breeding stations have been established in the Mallee, in the Wimmera, and in the north-eastern district, thus enabling the development and

[*Continued on page 25.*

Fig. 1.—Pigs on pasture controlled by an electric fence.

Pig Housing and Equipment

By L. A Downey, H.D.A., Pig Expert

IF, when establishing or enlarging a piggery, some consideration is given to planning the project, the requirements of both the pigs and the owner can be provided for at a comparatively low cost, and the piggery can be a section of the farm of which the owner may be proud. It is hardly possible to prepare a standard plan and specifications which would provide a piggery suitable for every farm. Individual pig-raisers must therefore use their own discretion, but in order to provide them with some material suggestions, which may be copied or used as a basis for developing their own plans, the following information and illustrations have been prepared as a guide. They are based on a collection of observations on housing and equipment which have proved successful for pig farming.

Several requirements of pig housing and equipment are the same in all circumstances. Firstly, it is necessary on an orderly farm to have pigs under control in pens or paddocks away from other stock, at least 150 feet from dairy buildings, and where they will not have access to drainage from cow yards or poultry yards. These latter precautions are necessary as the droppings of cattle and poultry are a possible source of tuberculosis infection in pigs.

Pigs require protection from extremely cold or hot weather; such protection can be considered as a means of saving pig food, as pigs do not grow economically when they are exposed to extremely hot or cold conditions. A high degree of sanitation is necessary in the piggery to keep pigs healthy, and in order that they may grow normally. Convenience in working the pig farm must be considered, as a convenient layout can save much labour.

The cost of the piggery equipment must, of course, be considered in the light of available capital and probable returns from the pigs,

but the cost of housing should also be calculated as the cost per head for each pig which is likely to be reared in the piggery. When this is done it is usually found that the cost per pig for housing is very small, and therefore it may be false economy to save a few pounds in the initial outlay if that saving means slower growth, higher food consumption, greater labour requirements or greater risk of disease. It is estimated that good housing and equipment for pigs on the usual small piggery costs from £1 10s. to £3 per pig capacity for capital outlay, and, when kept fully stocked, the depreciation cost per pig reared is from 1s. to 2s., which is a very small part of total production costs.

To provide a good state of sanitation in the piggery, the pigs should either be kept in pasture or cultivation paddocks which can be stocked lightly and in rotation, or they should be kept on the intensive system and provided with pens which have impervious floors and good drainage. Conditions between these two extremes, such as small bare earth yards, or pens with badly drained floors, are unsatisfactory in that they cannot be properly cleansed, and disease and parasitic infestation are thus encouraged.

The Paddock System.

The paddock or grazing system of pig raising has many features which commend it to Australian pig-raisers, and, while there is very little evidence resulting from controlled experiments to prove its superiority, observations indicate that this system is well suited to the majority of farms where pigs are raised in Victoria. Frequently, a combination of the paddock and the intensive system of pig raising is to be preferred.

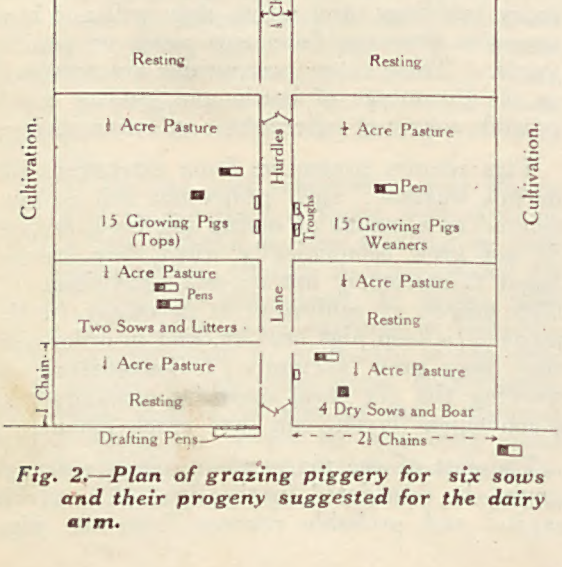


Fig. 2.—Plan of grazing piggery for six sows and their progeny suggested for the dairy farm.

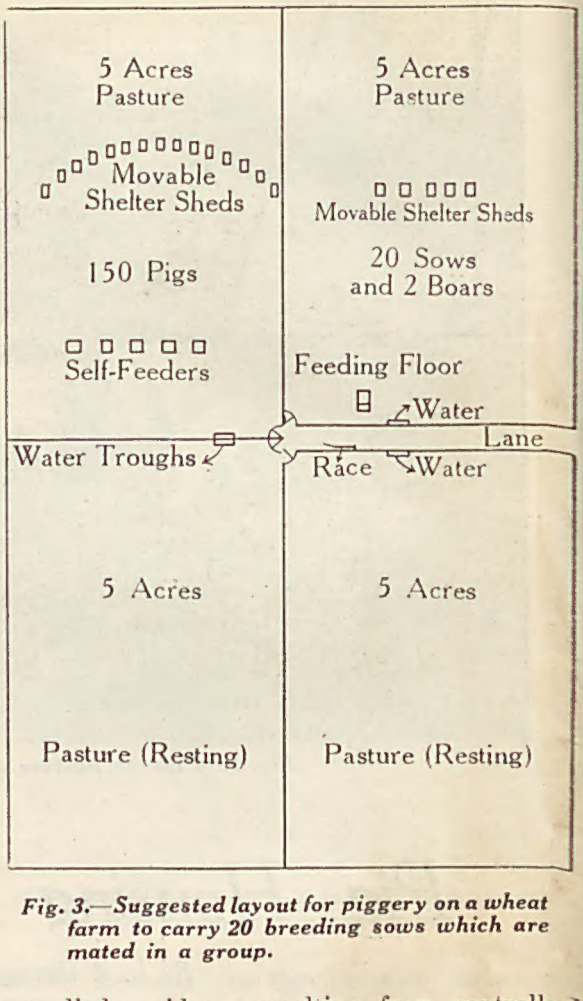


Fig. 3.—Suggested layout for piggery on a wheat farm to carry 20 breeding sows which are mated in a group.

The chief feature of a grazing piggery is a number of paddocks ranging in area from a quarter of an acre upwards, depending on the class of grazing and the number of stock to be carried. There should be sufficient paddocks to enable rotational grazing and resting or, where practicable, cultivation. It is also desirable to have pigs graded into lots according to size and to keep sows with young litters separate.

In dairying districts where first class pasture is available half an acre is usually sufficient for each brood sow and her progeny up to baconer weight provided the pig paddocks

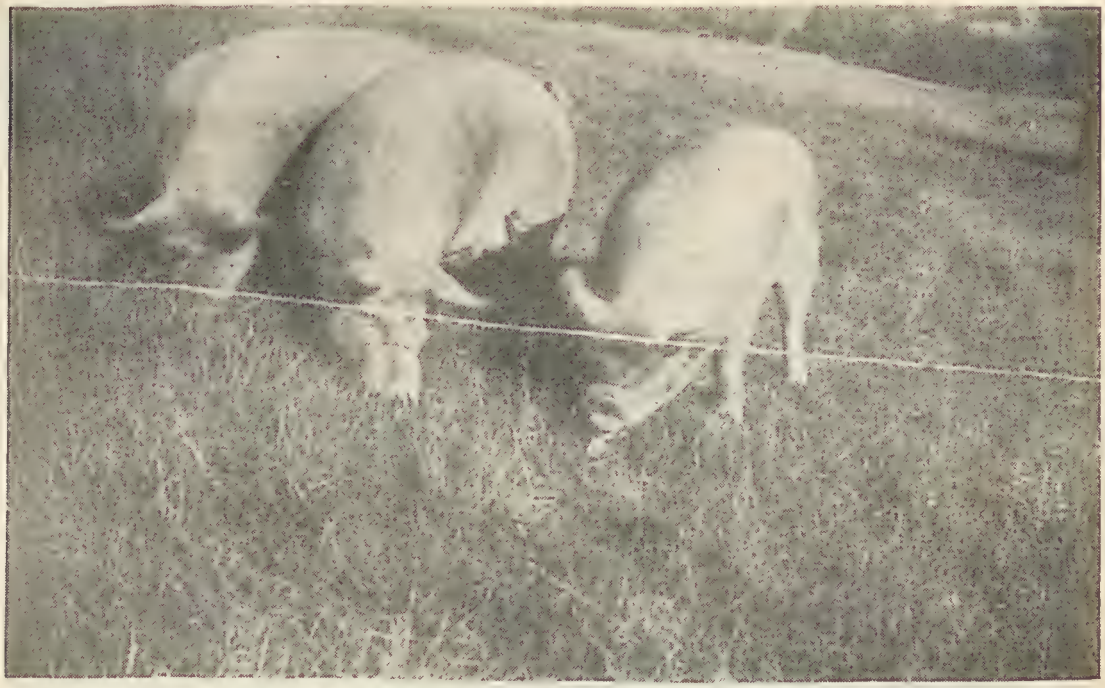


Fig. 4.—One wire 12 inches high connected to an electric fencer is sufficient to keep mature pigs in control.

are well subdivided and carefully managed. In drier districts one acre may be allowed to each sow kept. Dry breeding sows will gain almost all of their food requirements from good pasture, but sows rearing litters, and young growing pigs make only limited use of pasture, and so must be given full allowances of concentrated foods even when they are being grazed on a good sward.

Pigs running on pasture or forage crops gain necessary food accessories, i.e., minerals and vitamins, and thus have an advantage over pigs raised in intensive pens where they frequently suffer from dietetic deficiencies unless the farmer is particularly skilled and has a sound knowledge of nutrition. To gain the full advantages of the paddock system, all equipment such as shelter sheds and feeding

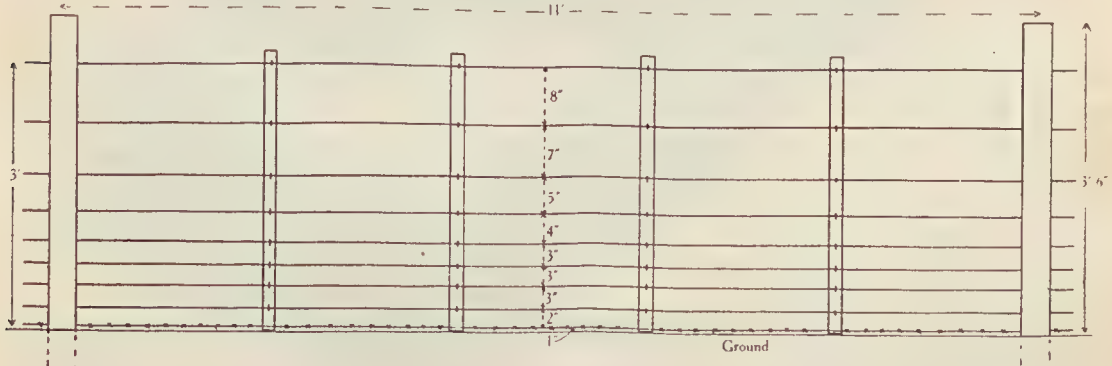


Fig. 5.—A panel of pig fencing comprised of one barb and eight plain wires. When kept well strained this fence is very effective for pig paddocks.

troughs should be so constructed that they can be moved about within a paddock or from one paddock to another. This prevents the ground from becoming fouled and allows a better dis-

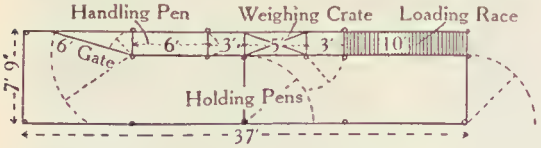


Fig 6.—Plan of drafting and weighing pens and loading race.

tribution of pig manure so that its full fertilizing value is obtained. Because the paddock system does not necessitate any cleaning up with broom and shovel, labour is saved and pig keeping is more congenial than under the small pen system.

It has been demonstrated that pigs can be satisfactorily reared from birth to marketing stage in paddocks without the use of fattening pens provided they are bred and fed correctly. The old custom of penning pigs to fatten them is gradually disappearing, as much leaner pigs are required for the pork and bacon trade than was the case years ago.

Plans of Grazing Piggery.

For the Dairy Farm.

A suggested plan for a grazing piggery on the average dairy farm, where the paddock system of pig keeping can be adopted, is shown in Fig. 2. It provides eight small pasture paddocks which can be grazed and spelled in rotation, with cultivation paddocks adjoining.

If matings are arranged in three lots of two sows, there would be, at most times, two sows with litters which could be kept in utility pens as illustrated in Figs. 7, 8, and 9. These pens should be moved frequently on to fresh ground

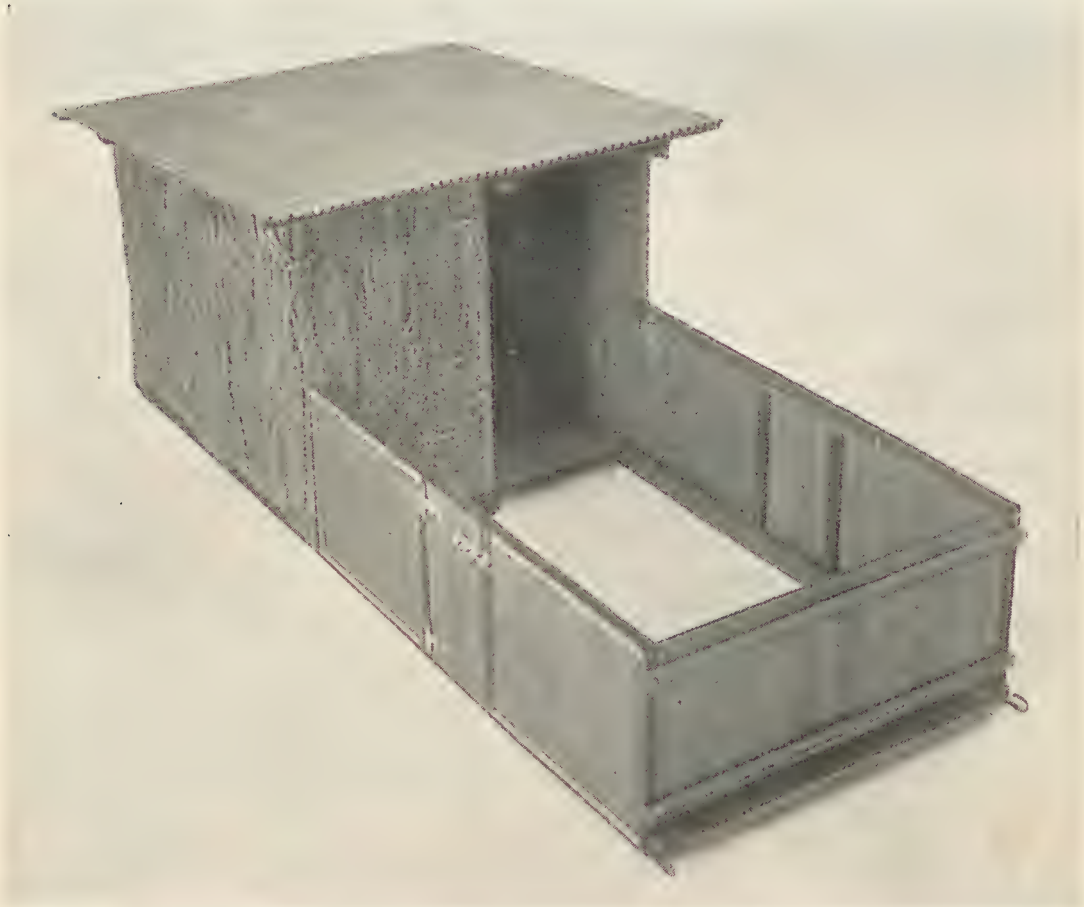


Fig. 7.—The utility movable pig pen designed for easy construction, light weight, protection for the pigs and low cost. The walls are of wire netting packed with straw. (See Fig. 8.)

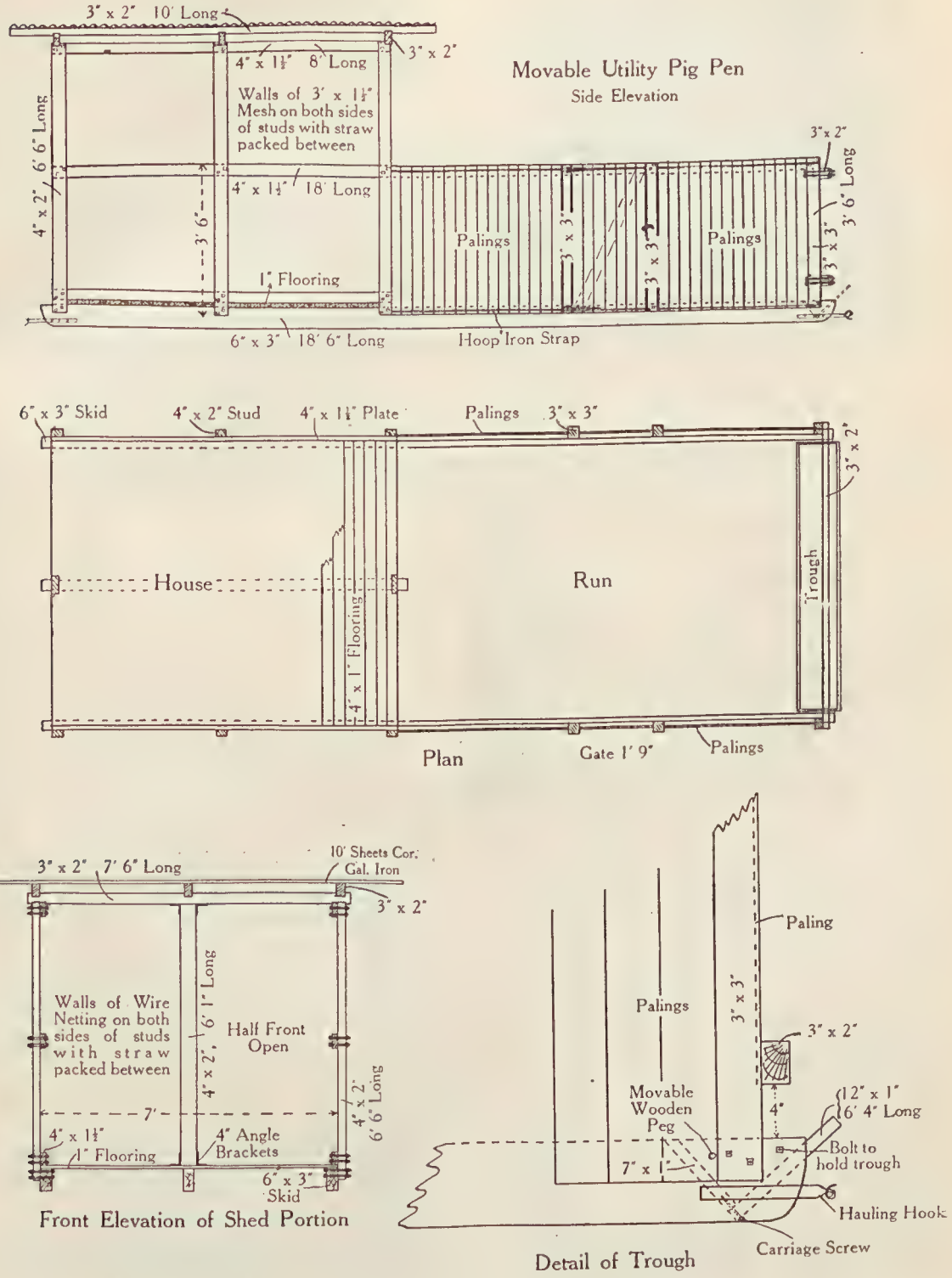


Fig. 8.—Showing details of the utility movable pig pen illustrated in Fig. 7.

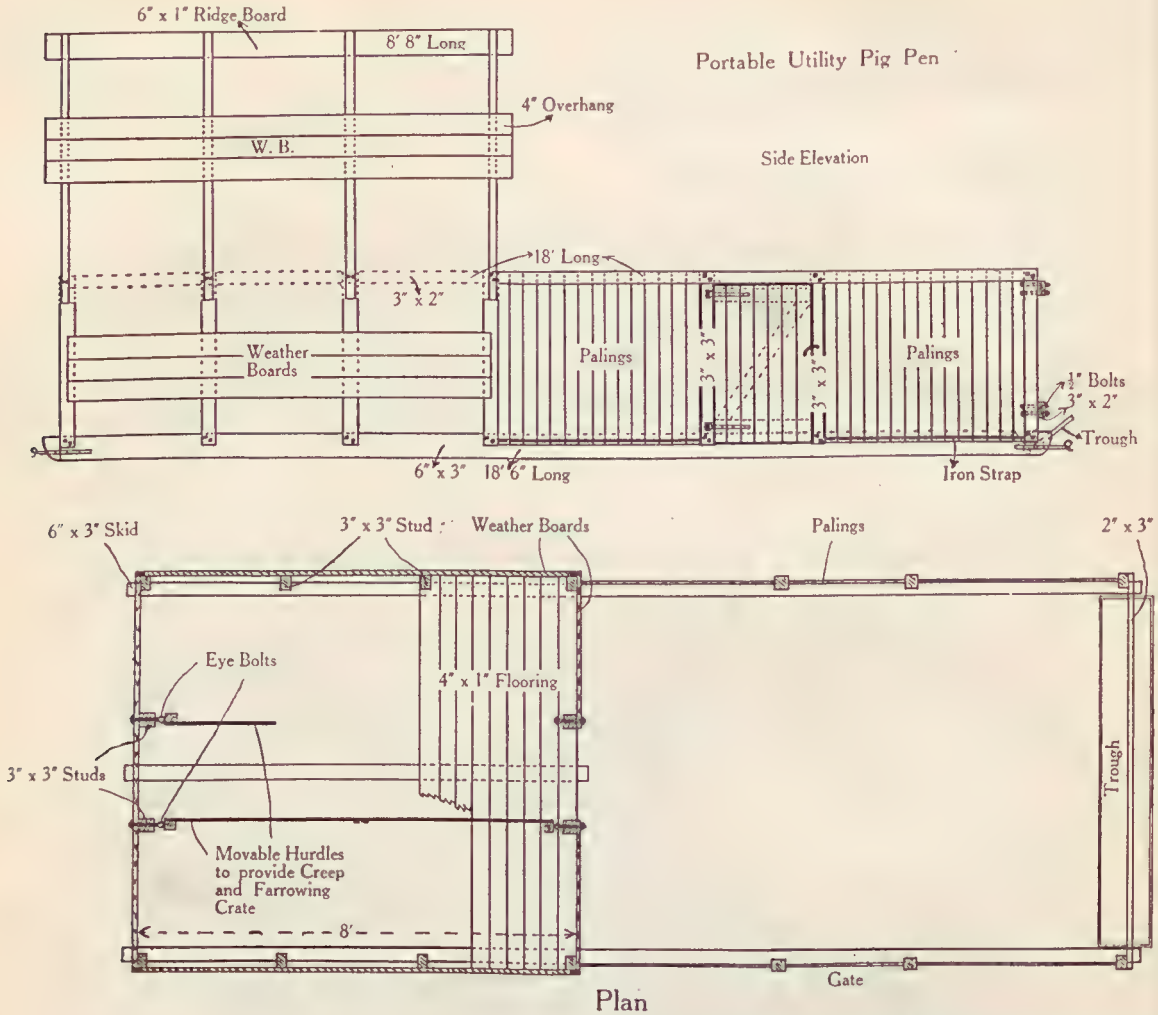
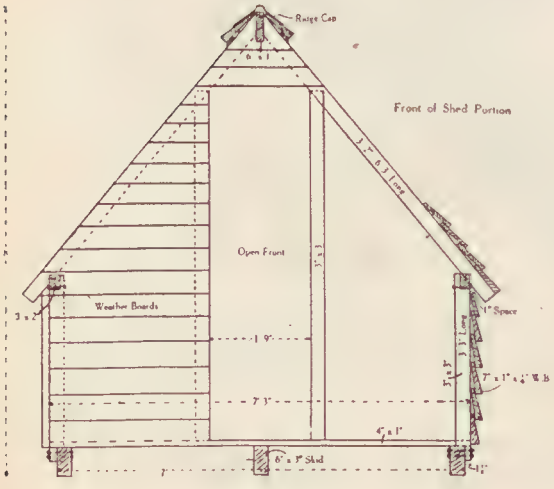


Fig. 9.—An alternative design of a utility movable pig pen walled and roofed with weather boards. Hurdles for farrowing sows are shown in the plan. See also Fig. 15.



within the paddock. After weaning, the sows are returned to the dry sow's paddock for mating and the weaned pigs are grouped and moved on to another paddock where they can be kept in a utility pen for a few weeks and then given the run of the paddock. At this stage they can be kept under control with an electric fence.

The growing pigs can be kept in paddocks until fit for marketing as porkers or baconers and if it is found desirable to draft off a few to be finished separately a utility pen may again be used in the paddocks. The central lane with portable hurdles and the drafting yards adjoining, enable the pigs to be conveniently handled,

and feeding may be done with the aid of a trolley on rails or a horse-drawn trolley, or milk may be delivered along the central lane by pipes.

Several of the shelter sheds are shown without runs attached, they represent the shed portion only of the utility pens shown in Figs. 7, 8, and 9, and are used for dry sows and growing pigs. The troughs shown are of the type illustrated in Fig. 10, while details of the drafting pens are shown in Fig. 6.

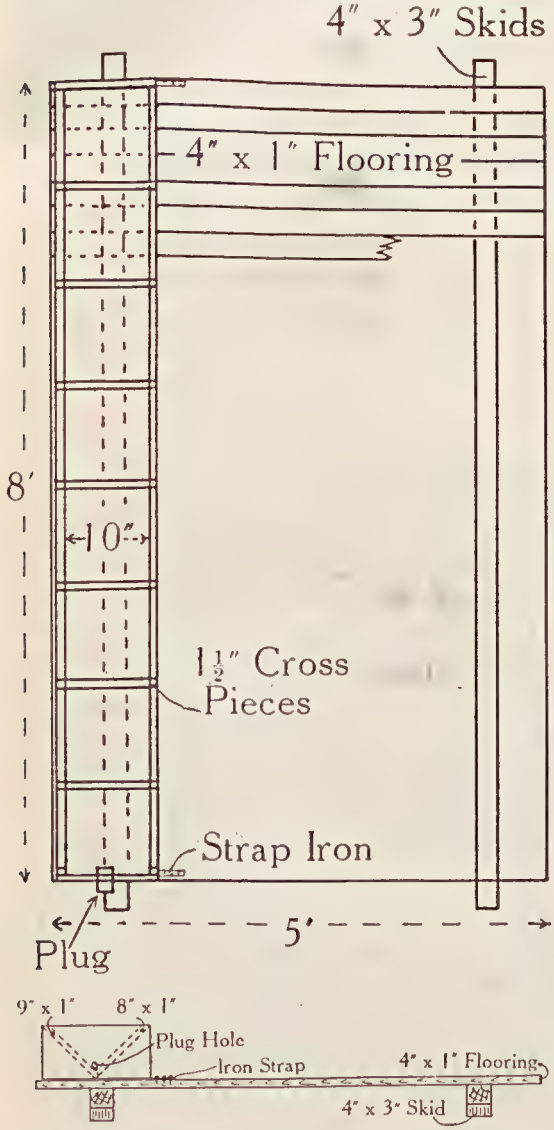


Fig. 10.—Showing plan and end view of wooden trough built on a movable platform. Movable equipment is most satisfactory for use in pig paddocks.

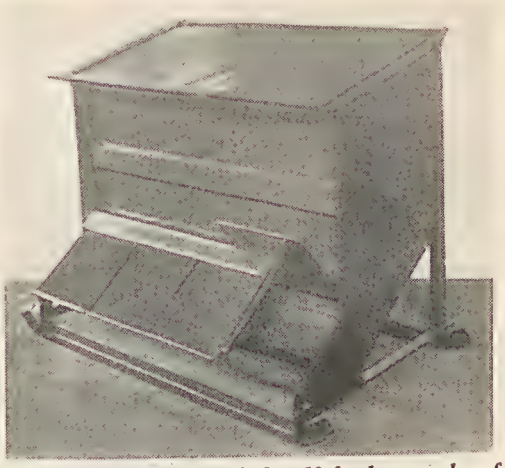


Fig. 11.—A single sided self feeder made of angle iron and sheet metal. Note the hinged lids and grooved iron between lids to keep rain out of trough.

Quarantine Pen.—A utility pen, away from the other pens, should be used for quarantine purposes. Newly introduced pigs should be isolated for a period of three weeks while they are kept under observation for disease.

For the Wheat Farm.

Wheat farmers, who feed their grain to pigs, are faced with a different proposition from dairy farmers, who keep pigs mainly to dispose of their separated milk, and, therefore, a somewhat different system of management, as shown in Fig. 3, is suggested. This plan provides for twenty sows and their progeny up to six months' old and is designed to have all sows mated at the one time, the boars being joined with the sows for one month. Farrowings could then be supervised by an attendant, each sow being allotted an individual shelter shed of similar design to that of the shed portion of the utility pens shown in Figs. 7, 8, and 9. A 6-in. board fixed across the doorway would keep the suckers in the shed until they were a few days old, when they could be allowed out.

The twenty sows would require a feeding floor 16 feet long and 9 feet wide with troughs along each side to give them ample feeding space for hand feeding. The suckers would require self-feeders, hurdled off from the sows, where they could get supplementary food, such as grain and meatmeal, to compensate for any "robbing" which may occur.

The pigs could be weaned when they averaged eight weeks old by drastically reducing the sows' food supply and leaving the suckers

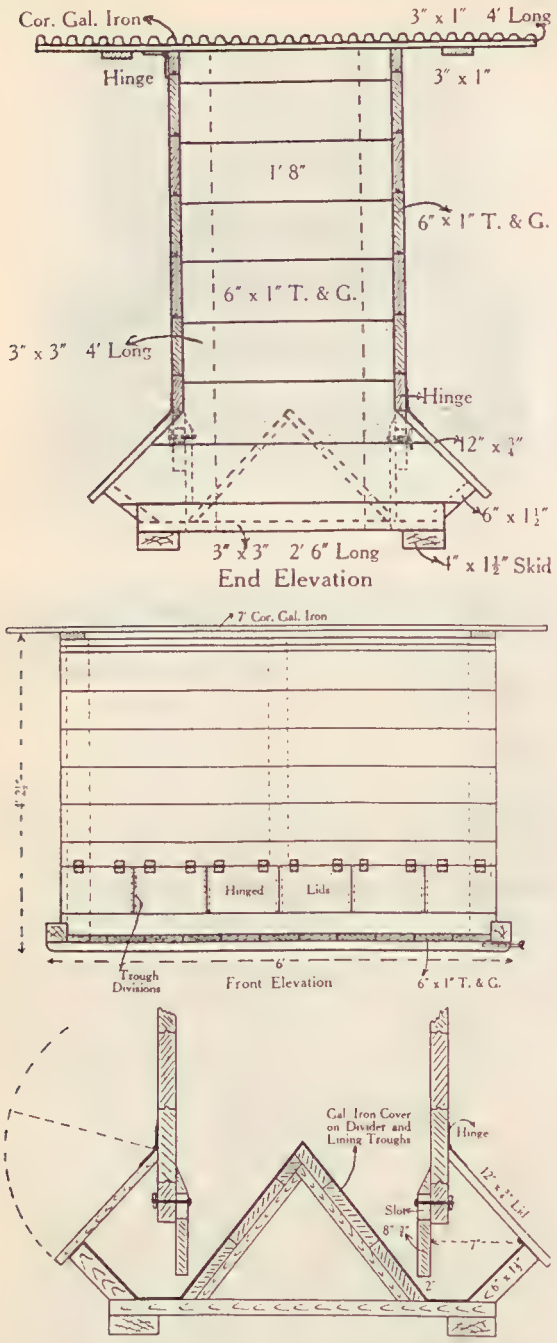


Fig. 12.—A double sided self feeder for 40 pigs.

at the self-feeders. After weaning, the pigs should be put into a paddock away from the sows and given shelter sheds and self-feeders Water should also be provided, preferably in automatic fountains or troughs.

The Movable Pig Pen.

To gain the full advantage of the paddock system of pig raising, it is necessary to have shelter sheds and troughs so constructed that they can be moved about to fresh ground within the paddock, or from one paddock to another. The utility movable pens shown in Figs. 7, 8, and 9 are designed for use in paddocks and can be used for a sow and litter, about twelve porkers, eight baconers, or five breeding sows when it is required to lock them up, but they can also be used as a shelter and feeding place only. With the gate opened the pigs can have access to pasture. When pigs are confined to utility pens it is essential to move the pens frequently by horse or tractor on to fresh ground.

Wooden floors built in two sections may be provided for temporary use in the open part of utility pens during very wet weather.

The utility pen (Figs. 7 and 8) is designed with an 8 feet by 7 feet sleeping shed with a wooden floor, and a 10 feet by 7 feet run with no floor and a trough at the end of the run. It is designed for easy construction, low cost, light weight and protection for the pigs. The walls shown in the drawings are 3 feet by 1½ inch mesh wire netting on the inside and outside of the studs. Between the two pieces of netting straw is stuffed tightly to give a wall up to 4 inches thick. Such a wall gives very good insulation from the extremes of weather, is inexpensive, light and can be easily removed and burned if it becomes necessary to thoroughly disinfect the shed.

The walls are about 6 feet high and there is a good overhang on the roof with plenty of ventilation space between the walls and roof. The shed, therefore, is capable of keeping the pigs cool in hot weather and there should be no necessity to provide another structure for cool shade, as is necessary when a low, iron shelter shed is used for pig housing.

An alternative style of movable pen is shown in Fig. 9; it is walled and roofed with weather boards for coolness and strength, and provision is made for the use of hurdles to make a farrowing crush for the sow or a feeding creep for the suckers.

Where it is not required to lock pigs in a pen, the shed portion only of the utility pens in Figs. 7, 8, and 9 can be used as a shelter for pigs in paddocks.

Fencing.

Satisfactory pig fencing has always been a problem for the farmer but the recently introduced "electric fence" has helped to solve the

problem. The "electric fence" has been used under varying conditions with a great deal of success. Its convenience, effectiveness and low cost commend it to the farmer who has more than a quarter of a mile of pig fencing to erect. See Figs. 1, 4, and 5.

Intensive Pig Pens.

When intensive pig pens are required they should provide a high degree of sanitation, protection from extremes of heat and cold, and ample ventilation without direct draught. This necessitates ample inlets for fresh air and an exit for foul air which will be efficient even when strong winds are blowing and it becomes necessary to close up the house. Direct sun-rays on the pigs are very desirable for the maintenance of health.

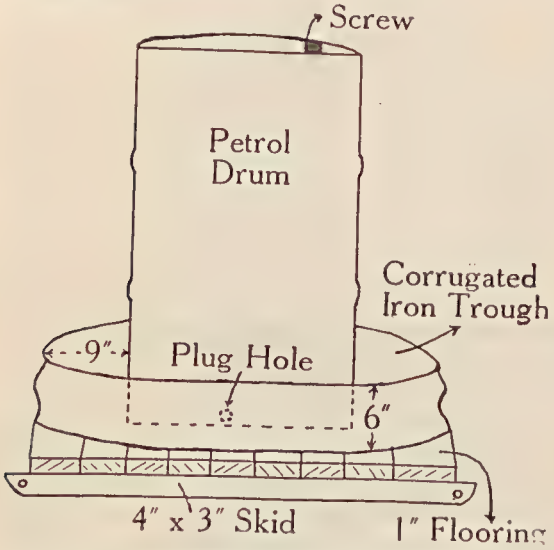


Fig. 13.—An automatic waterer for pigs. The plug hole is ½ inch diameter and 1½ inch from bottom of drum. It is plugged and the screw on top opened for filling the drum, then the screw is replaced and the plug removed to keep the trough full of water.

Fig. 14 shows a pair of intensive pens which could be multiplied to any desired number. Each pen is capable of holding up to ten fattening pigs and if a farrowing crate (Fig. 15) is provided the pen could be used for farrowing sows and their litters.

The pens are so planned that the drainage is kept away from the sleeping section; the passage at the back provides a place where the pigs may go to dung instead of fouling their feeding and sleeping places. Drainage from each pen is separate from the adjoining pen and goes into an outside drain through an outlet in the back wall. The troughs have a screw plug which enables them to be emptied towards the drain.

These pens provide comfort and convenience for both the pigs and the attendant, and, while they may be considered elaborate, they are a good investment where intensive pig housing is required. Their cost, including labour and material, is estimated at £60 per pair or £3 per pig capacity, but, as twenty pigs can be accommodated during their growing stage of say four months, three lots of twenty pigs could be housed in a year. In an estimated life of 20 years the pens could accommodate 1,200 pigs. The £60 cost of the pens spread over 1,200 pigs would give a housing cost of only 1s. per pig. Good housing for pigs is therefore a sound investment.

Self-Feeders.

Self-feeders are a labour saving device which can be used to advantage where grain or meals form a large part of the pigs' diet (Figs. 11 and 12). Self-feeding, as a means of supplementary feeding, can be practised satisfactorily with suckers running with the sows and, in some circumstances it may pay also to give sows suckling large litters access to a self-feeder. Dry sows tend to become too fat when self-fed and, therefore, should be hand fed a limited quantity of grain or meal and made to graze where possible.

The self-feeder is very useful for feeding pigs at weaning time and may be used until the pigs are fit for slaughter, excepting where it is desired to force them to consume large amounts of pasture or forage crops or other less palatable but cheaper foods. The self-feeder should be so constructed that it will hold several days' food supply which will feed freely into the trough.

Self-feeders provided with hinged lids over the trough can be used out in the paddock, as they protect the food from weather, rats, and birds. When pigs are given dry food they must have access to water at all times.

Farrowing Crate or Guard Rail.

Some sows, through clumsiness or a nervous temperament, are apt to kill some of their pigs at the time of farrowing or during the few days following. This loss can be prevented to some extent by fitting guard rails in farrowing pens about 7 inches from walls and 9 inches

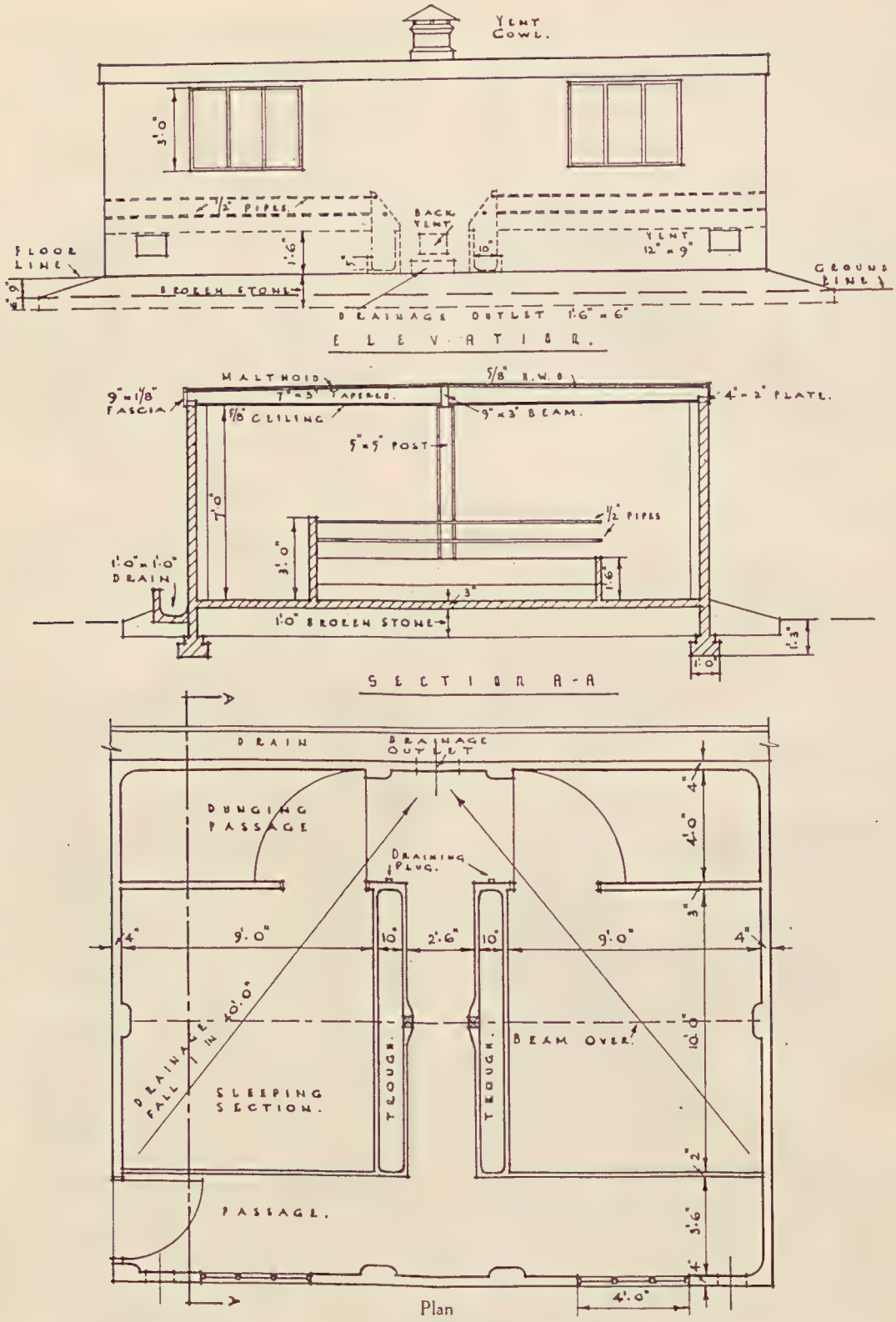


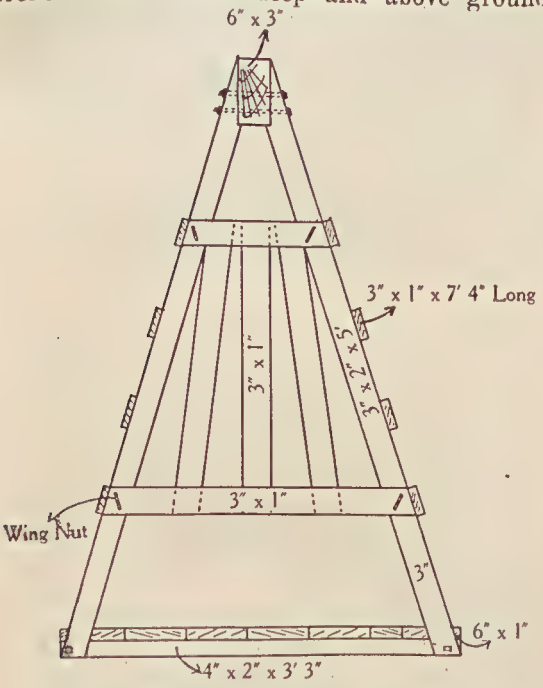
Fig. 14.—A pair of intensive pig pens.

from the floor. In this way the young pigs are provided with a safety zone around the walls.

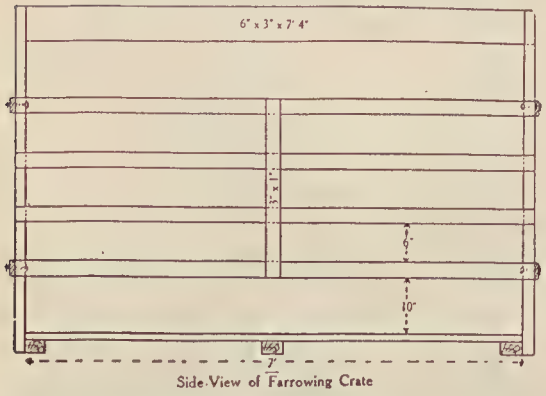
Another device for the same purpose is the farrowing crate or crush (Figs. 15 and 16). The crate is placed in the sow's pen where she can get into it and become accustomed to it a few days before farrowing. When she is about to farrow she can be locked in.

Concrete in Pig Pens.

Concrete floors in pig pens should be set on a foundation of coarse material such as broken stone 1 foot deep and above ground



End View of Farrowing Crate



Side View of Farrowing Crate

Fig. 15.—Sketch of farrowing crate to be used with difficult sows.

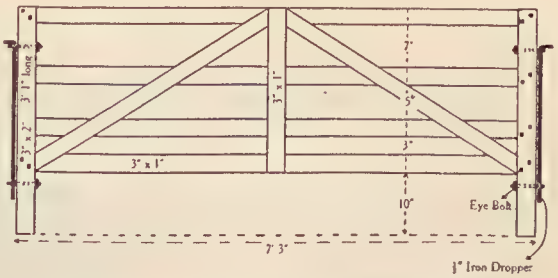


Fig. 16.—A hurdle for use as a farrowing crush or creep in pen illustrated in Fig. 9.

level to check cold and dampness rising from the ground to the concrete floor. Floor surfaces should be finished with irregular grooves to give the pigs a grip and prevent slipping.

To check the disintegration caused by acid from milk and other foods and to make concrete more waterproof, the concrete should be given three applications of silicate of soda (water glass) as it is setting. This comparatively inexpensive operation prolongs the life of concrete floors and troughs. The usual method of application is to mix 1 gallon of silicate of soda with 4 gallons of water and spray it on concrete when it is just beginning to set. This is followed by two more dressings at intervals of 24 hours.

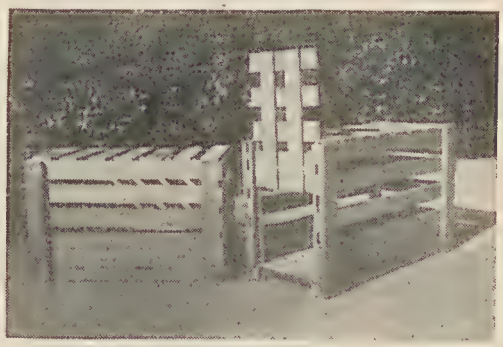


Fig. 17.—Crates suitable for transporting or weighing pigs.

Weighing Pigs on the Farm.

A 300-lb. clock-face scale costing approximately £3 is a good investment to the pig raiser. To measure the production of breeding stock the litters should be weighed when they are weaned. A wide variation is found in the production of different sows and such a measure of performance can be of inestimable value to the breeder in the selection and culling of breeding stock.

Pork and bacon pigs are sold on actual or estimated dressed weights and buyers prefer

[*Continued on page 48*

The Preservation of Apples and Pears

Some Useful Recipes

By Miss R. Peile, Assistant Fruit Preserving Expert

AS apples and pears will be plentiful this season, housewives should readily accept the following methods of preserving and utilizing these fruits for meals and storage for future use. Apples and pears, as well as having a high vitamin content are delicious in flavour and contain a high percentage of mineral salts which are so necessary in maintaining good health, and which are not impaired, in any way, during the process of cooking. To all those who are interested in the utilization and preservation of fruits, this information will prove helpful.

Useful Hints.

Jams and Jellies.—To prevent the formation of mould, always bottle jams and jellies in perfectly dry jars and seal when cold. Crystallization is caused by too much sugar or too much boiling. Fermentation is the result of the use of insufficient sugar or underboiling.

Always bottle jellies at boiling heat, otherwise small air bubbles will be suspended in the cooling jelly.

Bottled Fruits.—Too strong a syrup, or overcooking, will cause fruits to rise in the jar. When peeling apples and pears for bottling, drop them into slightly salted water until a sufficient quantity is prepared in order to prevent discolouration.

Bottling Apples and Pears.

Expensive equipment for the preservation of apples and pears by bottling is not necessary. A suitable sterilizer can be made from any vessel which is deep enough to permit the jars to be properly covered, providing it has a well-fitting lid. The only extra appliance required is a wooden platform 2 inches less in diameter than the vessel itself and standing about 4 inches high.

It can be made of one piece of wood well perforated, or strips of wood supported by two cleats. This platform is placed in the vessel and cold water poured in until it reaches to within an inch of the top, and the fruit sterilized. A kerosene tin, or the washing copper, both make suitable sterilizers and have the advantage of being in nearly every home.

The Method.—Mid-season fruit is the best for bottling and it should be firm-ripe. Both apples and pears are fruits which discolour readily and, therefore, while peeling, coring, and preparing them for bottling, drop them into slightly salted water (1 tablespoon of salt to 1 quart of water), then pack them neatly, but firmly, into the jars and rinse well with cold water. Fill to the neck of the jar with cold syrup made previously (4 oz. of sugar to 1 pint of water).

Pour into the sterilizer sufficient cold water to reach just below the surface of the stand, then place the jars on the platform in the sterilizer with the lids laid loosely on. Place the cover on the sterilizer, bring the water to the boil, and sterilize the fruit for the necessary length of time (about 20 minutes, or until the fruit is cooked—this is ascertained by inserting a sterilized darning or knitting needle right through the fruit) which is determined from the time the

Suitable fruit bottling equipment.

water starts to boil. When the fruit is cooked, remove the bottles or jars from the sterilizer on to a damp folded towel, place the rubber rings in position, overflow with boiling syrup and seal down immediately

Drying Apples and Pears.

Either cooking or firm-ripe dessert apples and pears are suitable for drying. Peel, core, and slice them. During preparation, drop the peeled fruit into slightly salted water to prevent discolouration. Do not allow it to remain too long in this solution. Rinse well, then place the fruit on trays of a convenient size for sulphuring. This process is carried out by placing the trays of fruit in a box of a length and width to admit the trays being slipped in or out readily, and of a height to suit requirements, on the sides of which should be fastened cleats 3 or 4 inches apart for tray rests. The fruit is then placed in the cabinet and enveloped with fumes of burning sulphur.

The amount of sulphur used is approximately in the proportion of 1 lb. to every 100 cubic feet, but depending somewhat on the length of process. The sulphur should be put in a suitable receptacle, placed on the floor of the box and ignited, the box or cabinet then closed, and the fruit subjected to the fumes for five minutes. When sufficiently sulphured, it is then ready for drying. Dry the apple slices until they are soft and velvety to the touch and of a pliable texture. If preferred, the sulphuring may be omitted, but the product is very much better if this operation is included.

Effective drying may be done indoors, either in a cool oven with the oven door partly open, or preferably, by a small home evaporator. If using an oven, the pieces of fruit should be placed on the trays. As the fruit gradually dries, the pieces should be turned occasionally until they are springy and pliable. When sun-drying, the apples and pears are placed on the trays and exposed to the sunlight and open air. The length of time required varies with the different fruits, sizes of pieces, temperature, and weather conditions. If there be any dew or rain, the trays should be stacked one over the other and a cover thrown over the whole as a protection from dampness.

Directions for Making a Home Evaporator.

The evaporator should be of a size that will fit on a range or in a fireplace, and it should be fitted with wire trays placed as shelves. It may be either suspended over, stood on, or even hung in the vicinity of the kitchen range where currents of heated air will pass over and about the product, gathering the moisture and carrying it away.

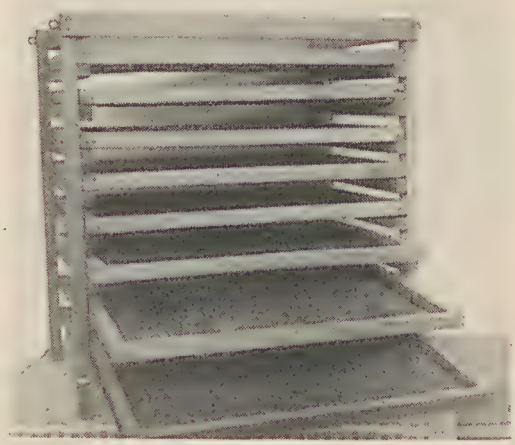
One measuring 24 inches high by 24 inches wide and 18 inches deep is a useful size. The material required for the frame would be—

Four corner uprights 26 inches x $1\frac{1}{2}$ inches x $\frac{7}{8}$ inch.

Four end pieces (two for each end of frame) 18 inches by $1\frac{1}{2}$ inches by $\frac{7}{8}$ inch.

Four pieces (two each for back and front) 24 inches x $1\frac{1}{2}$ inches x $\frac{7}{8}$ inch.

Sixteen tray rests (eight for each side) 18 inches x 1 inch x 1 inch.



A home-made drying rack.

Trays for the above may be made by first making a frame of two pieces of 22 inches x 1 inch x 1 inch and two of 18 inches x 1 inch x 1 inch, and then tacking to this a square of wire gauze, fastening it on more securely with narrow laths.

To suspend the evaporator, a wire may be fastened to each top corner, and the four wires made to meet in a centre ring. If this method be impracticable for any reason, the way that convenience dictates may be followed.

If stood on the stove, four supports or feet should be placed underneath the evaporator, so as to lift it high enough to prevent burning.

Pulping.

The pulping of apples and pears is a quick method of preservation and large quantities of pulp may be put up in big or small containers. If required, sufficient could be stored in petrol tins for making into jam or sauce at a later period. It could also be used for cooking purposes. For jam or sauce, the pulp would need to be re-cooked, with the desired amount of sugar and the necessary flavourings and then finished in a similar manner to fresh fruit.

Method.—Peel, core, and cut the fruit into quarters. Add sufficient water to completely cover the bottom of the pan. Boil from 15 to 30 minutes. Meanwhile, sterilize the containers and ladle and, if required, a wide mouthed funnel. This is done by placing them in a cool oven and gradually heating it or by putting them into a large vessel of cold water and bringing the water to the boil. When the pulp is ready stand the containers on a damp cloth, fill them quickly with the boiling pulp, and seal them immediately. No sugar or preservatives are required. The essential points to remember are thorough sterilization and sealing the containers while the contents are at boiling point. Sweetening and flavours may be added when using the pulp.

Recipes for Jams, Marmalade, Butters, &c.

JAMS.

Apple Jam—

6 lb of apples
1 lb. of preserved ginger
4 drops of oil of cloves
3 pints of water
4½ lb. of sugar
Juice and rind (if liked) of four lemons.

Peel, core, and slice the apples. Tie peelings and cores in muslin and boil with the apples, lemon rind, and ginger for about one hour. Remove peelings and cores, add sugar and oil of cloves and lemon juice and boil till it responds to the setting test.

Apple Ginger—

6 lb. of apples
4½ lb. of sugar
¼ lb. of whole ginger.

Peel and core the apples and slice them. Cover the peelings and cores with water and simmer for about half an hour, then strain. To this strained liquid add the prepared apples and bruised ginger (the latter tied in muslin) and simmer about 1½ hours. Then add the sugar and simmer till a good consistency.

Pear and Passion Fruit—

4 lb. of firm pears
2 doz. passion fruit.

Weigh, and allow ¾ lb. of sugar to each 1 lb. of fruit.

Simmer all ingredients together till a good consistency and colour.

Blackberry and Apple—

6 lb. of blackberries
2 lb. of apples
8 lb. of sugar
Juice of 2 lemons.

Peel, core, and slice the apples and simmer till cooked in very little water, then add the blackberries and simmer till cooked (about 15 minutes). Put in the sugar and lemon juice and boil rapidly until it responds to setting test.

Melon, Apple, and Lemon—

6 lb. of melon
2 lb. of apples (sour).
6 lb. of sugar
1½ pints of water
4 lemons.

Sprinkle a little of the sugar on the prepared melon over night. Next day add the water, sliced apples, and lemons, and simmer till cooked. Then add remainder of sugar and boil rapidly until it responds to setting test.

Pear Ginger—

6 lb. of pears (firm and slightly underripe)
4½ lb. of sugar
1½ lb. of preserved ginger
1 pint of water.

Peel, core, and cut pears into quarters and thinly slice the ginger. Sprinkle small portion

of the sugar on over night, then boil next day with remainder of the sugar till a good consistency.

Banana and Pear—

6 lb. of peeled and cut-up bananas
2 lb. of peeled, cored, and sliced pears
Juice of 2 lemons
5 lb. sugar.

Put the prepared fruit in the pan and sprinkle a little of the sugar over it, also the lemon juice. Add just enough water to cover bottom of pan. Simmer with lid on till fruit is cooked, then add remainder of sugar and boil rapidly till a good colour and consistency.

Pear Conserve—

4 lb. of sour apples
8 lb. of cooking pears
6 lemons
4 oz. preserved ginger
2 oz. of whole ginger
Water
Sugar.

Peel and core the pears and drop them into slightly salted water to prevent discolouring. Wash the apples and the lemons, cut them up, and put them into the pan with the pear peelings and bruised ginger. Cover the peel, &c., with water and simmer all gently until the apples are tender, then strain first through a colander, then through a damp flannel. Measure the extract, then allow 1 cup of sugar to 1 cup of liquid. Put liquid back in pan, warm and add half the sugar. Put in the pears, cut lengthwise, and simmer until the pieces are tender. Then add rest of sugar and the preserved ginger, cut up in small pieces, and boil until the jelly will set when tested.

Pear and Pineapple—

6 lb. of pears (firm-ripe)
1 medium pineapple
5 lb. of sugar
1 pint of water.

Peel, core, and slice pears and pineapple. Simmer till cooked (about one hour), add sugar and boil till a good colour.

Spiced Pears—

4 lb. of firm cooking pears
2 lb. of brown sugar
1 pint of vinegar
6 or 8 cloves
Small stick of cinnamon
6 or 8 spice berries.

Peel, core, and cut up pears. Make a syrup of the other ingredients, then put in the pears and simmer till tender, then lift out the fruit, boil up the syrup for ten minutes, and pour over the fruit. Repeat the next day, then bottle and store.

Bottled Williams pears.

Quince and Apple Honey—

Peel and core a half-dozen each of quinces and apples and grate the raw fruit. Measure the pulp and allow ¾ cup of sugar to each cup of pulp. Cover the sugar with one quart of boiling water and heat and stir until the sugar is dissolved, then add the fruit pulp and juice of two lemons. Continue cooking the mixture until clear. Pour into containers and seal cold.

MARMALADES.

Apple Marmalade—

6 oranges
3 lemons
9 large apples
9 cups of sugar
3 cups of water.

Peel and slice apples and cover with lemon juice and water. Wash oranges and cut into thin slices. Shred lemon rind. Add sugar and let the whole stand for one hour. Bring to boiling point and cook slowly. Boil until good consistency. Allow to stand for a few minutes, then bottle and seal when cold.

Passion Fruit, Lemon, and Apple—

4 medium sized lemons
1½ quarts of water
2 lb. of cooking apples
1½ cups passion fruit pulp
Sugar to measure.

Packing fruit into the jars.

Halve the lemons and squeeze out the juice. Peel, core, and slice the apples. Beat the passion fruit pulp a little and strain it. Put the apples into the preserving pan, with the strained lemon juice, passion fruit, water, and the half pieces of lemon peel. Simmer until cooked, then remove the pieces of lemon peel. Measure the jam and put in an equal measure of sugar. Boil rapidly till it responds to setting test.

Butters.

Pear Butter—

Select ripe, sound pears, weigh them, then wash, peel, core, and slice. Put fruit in pan with small quantity of water and simmer slowly for 1½ hours, stirring frequently. Add to each quart of the cooked pulp the juice of half a lemon, then stir in one cup of brown sugar and continue cooking until the sugar is dissolved and the butter a thick consistency. Ginger or cinnamon may be added for flavour if desired. Pack into jars and seal when cold.

Apple Butter—

The peeled and cored fruit is cooked slowly for a long time in cider or else in apple water. It is not necessary to add sugar as when concentrated by a long, slow cooking, the product is usually sufficiently sweet. Any flavouring agent such as cinnamon, ginger, cloves, or other similar ingredient, is usually added, and its appearance when finished should resemble a smooth thick paste, brown in colour. It is then stored in small pots for future use.

Apple and Lemon Butter—

3 lemons
6 lb. cooking apples
2½ lb. of sugar.

Prepare lemons the night before they are needed. Wash, dry, and grate the rind, then slice the lemons thinly, cover with water and let soak over night. Next morning, peel, core, and cut up the apples, add the lemons, and cook for about one hour slowly, or until quite thick and bright, then strain, add the sugar and cook for another half hour, or until it becomes a good consistency. Pack into jars and seal when cold.

Rhubarb and Apple Puree (suitable for tart fillings, puddings, sweet sauces, &c.)—

6 lb. of apples
1 pint of water
3 lb. of rhubarb
Sugar to taste.

Prepare the fruit, put in preserving pan, add the sugar and water. Boil till the fruit is thoroughly cooked. Strain, then reboil. Put into hot jars and seal at once.

Jellies.

Apple Jelly—

Allow half a pint of water to every pound of freshly picked, under-ripe apples. Simmer about 1 hour with lid on, then strain through a colander or sieve, then the liquid through a damp piece of flannel. Measure this strained liquid and to each cup of it allow 1 cup of sugar. Boil with lid off till it responds to setting test (about 30 minutes).

Blackberry and Apple—

6 lb. of firm blackberries
3 lb. of sour apples
Water to level of fruit in pan.

Make as directed for plain apple jelly.

Pineapple and Apple—

2 lb. of pineapple
6 lb. of sour apples
3 pints of water.

Make as directed for plain apple jelly.

Apple and Quince—

4 lb. of sour apples
4 lb. of sour quinces
6 pints of water.

Make as directed for plain apple jelly.

Spiced Apple Jelly (for cold meats, &c.)—

Wash the apples and cut them up roughly, then barely cover with a mixture of three parts of vinegar and one part water. Cook till quite

soft, then strain through a sieve. Put the liquid back into the preserving pan and add to it a little stick of cinnamon and some cloves and whole ginger, according to taste. Boil altogether for about 15 minutes, then strain and add three-quarters of a cup of sugar to each cup of liquid. Boil rapidly till it will set when dried.

Apple Pectin Extraction for Jelly Making.

The peelings, cores, and windfalls of tart cooking apples may be treated in the following manner and will prove most useful if kept in reserve for using with fruits which are deficient in pectin, such as strawberries, over-ripe blackberries, &c.

Cook together in a covered pan a fair quantity of thinly sliced windfalls and cores and skins of apples for 30 minutes, allowing 1 pint of water to each pound of fruit. Strain off juice and re-cook pulp with one pint of water per pound of fruit for a further 20 minutes. After the second cooking, allow the fruit to stand for five minutes. Strain off the juice, pressing the pulp to secure as much juice as possible. Mix the two extracts and strain through cheese cloth. Put the juice back in the pan in small quantities and concentrate it to half its amount, leaving the lid off the pan, then strain it through double cheese-cloth and pour, while boiling hot, into small dry bottles and cork down. To make the bottles airtight, invert them and dip the tops in melted paraffin wax. Use three-quarters of a cup of extraction to 1 quart of fruit juice or fruit pulp.

Chutneys.

Apple Chutney—

5 lb. of apples
2 teaspoons of wholespice
4 teaspoons cloves
1 teaspoon chopped garlic
Pinch of cayenne
2 lb. of sugar
1 quart of vinegar
1½ lb. of onions
1 tablespoon of salt
1 lb. of sultanas.

Simmer all till a good colour and consistency.

Filling jars with boiling syrup.

Apple and Ripe Tomato—

6 lb. of ripe tomatoes
1 lb. of sugar
½ oz. of mustard seed
½ teaspoon of cayenne
1 lb. of shallots
1 lb of sultanas (if liked)
1 lb. of sour apples
1 pint of vinegar
½ oz. of ground ginger
½ doz. chillies
2 tablespoons of salt.

Simmer until well cooked (about 1 hour) then rub through a sieve, reheat, and bottle.

English Chutney—

6 large ripe tomatoes
6 large sour apples
4 medium sized onions
1 lb. of seeded raisins
1 lb. of light-brown sugar
1 quart of vinegar
3 tablespoons of salt
1 teaspoon of cinnamon.

Cut finely, cook slowly for three hours, then put into jars and seal.

Desserts.

Preserved Pears with Coffee Jelly—

1 lb. of pears cooked in syrup
½ oz. gelatine
Few drops of yellow colouring
½ pint of strong coffee
1 tablespoon sugar
Vanilla or ginger flavouring.

Drain half a pint of syrup from pears and strain it, make it warm, add to it half the gelatine and, if not sweet enough, add a little more sugar. When cold add the flavouring, strain again and pour into a tall mould previously rinsed in cold water, then allow to set. Meanwhile make half a pint of strong coffee and add the rest of gelatine and 1 tablespoon of sugar. Rinse a border mould with cold water and, when the coffee is cold, pour it into the mould and allow to set. When required for use turn out both jellies, placing the tall one inside the brown border of coffee jelly. Place the white pears around the mask top with whipped cream.

Apple Souffle—

1 cupful of apple pulp
2 oz. castor sugar
2 eggs
½ oz. butter
Piece of one lemon and a little grated rind.

Pass the apple pulp through a sieve, put the sugar, lemon, and egg yolks into a medium-sized basin and beat them together until of a creamy consistency, then add the apple pulp and mix all together. Beat the egg whites stiffly and stir them lightly into the mixture. Put into paper cases or a pie-dish and bake till firm to the touch. Sprinkle with castor sugar before serving.

Apple Whip—

2 cupfuls of apple pulp
1 tablespoon of lemon juice
Sugar to taste
2 egg whites
2 tablespoons of whipped cream.

Beat the egg whites stiffly and add to apple pulp, continue to whisk the mixture until it becomes light and frothy, then stir in the whipped cream. Serve in small glasses with wafers.

Pear Royal—

2 dessertspoons gelatine
3 large pears
½ pint of cold water
¼ pint of wine
1 tablespoon of lemon juice
¼ cup of hot water
2 tablespoons sugar (or more)
3 cloves
¼ teaspoon of cinnamon
Thin stir of lemon rind.

Peel and core pears and cut into quarters. Place in dish with cold water, lemon juice, sugar, cinnamon, and cloves. Cover the dish and bake in a gentle oven until quite tender, but do not allow to break. When cooked lay the pears in a plain wet mould. Simmer one cup of the liquid in which pears were baked with strip of lemon rind for five minutes. Cool, add gelatine dissolved in hot water and wine. Strain and pour over the pears. If setting in an ice chest or refrigerator, use less gelatine—1½ dessertspoons.

Apple Puree and Rice—

1½ cups of apple pulp (strained)
1½ cups of cooked rice
½ cup of sugar
Cake crumbs
Juice of one lemon
About 6 cloves
Nutmeg
1 tablespoon butter.

Heat the apple pulp in a saucepan and add the sugar, lemon juice, and cloves. When sugar is dissolved, put the mixture in an earthenware dish previously greased, then a layer of cooked rice. Smooth the surface and sprinkle liberally with cake crumbs and a little grated nutmeg, and lastly, distribute small pieces of butter over the surface. Bake in a good oven till nicely browned and well heated through.

Apple Sponge—

½ oz. gelatine
1 lb. of apples
Grated rind of 1 and juice of two lemons
3 eggs
½ lb. sugar
½ pint of boiling water.

Boil sugar and water until clear. Remove scum; peel apples, core and slice them into syrup. Cook till tender. Cover gelatine with cold water and let it soak while apples are cooking. Add to the cooked apples then strain the whole through a sieve. Add the rind and juice of the lemons and stir until cold and slightly thickened. Beat the whites of the eggs to a stiff froth, stir them into the apples, then beat until cold and thick. Pour into a mould to set. Serve with custard or whipped cream.

Orange and Apple Pie—

4 apples
2 tablespoons lemon juice
Grated rind of ½ lemon
2 tablespoons finely-minced orange peel
1 cup sugar
2 tablespoons orange juice.

Peel apples and cut in thin slices; mix with remaining ingredients and place in baking dish. Cover with rich biscuit dough and bake in moderate oven for 40 minutes.

Currant and Apple Tart—

Line a tin plate with good pastry. Peel and core three or four large cooking apples, slice very thinly and put a thick layer of the sliced apple on the pastry, then sprinkle a handful of currants and raisins and a few thin slices of lemon peel over them. Add a handful of sugar, then another layer of apples. Sprinkle with sugar, cover with pastry. Pierce the pastry with a fork and bake in a moderate oven for half an hour. This makes a delicious tart.

Pear Meringue—

5 large ripe pears
6 tablespoons of sugar grated lemon rind
Preserved ginger
3 egg whites
¼ cup of castor sugar.

Peel and core the pears, place them in a baking dish and fill the centre of each with one tablespoon of sugar and a little grated lemon rind or preserved ginger. Add 3 or 4 tablespoons of water and bake until tender. Cover them with a meringue made with stiffly beaten egg whites and the sugar. Brown quickly.

Swiss Pudding—

2 breakfast cups of bread crumbs
2 oz. of suet
¼ lb. of sugar
A little nutmeg
2 lb. of cooking apples.

Peel and core the apples and stew them with a tablespoon of the sugar and a little water. Mix the bread crumbs, suet, nutmeg, and sugar all together. Put in a layer of this mixture in a pudding dish, then add the apples and on the top put the remainder of the crumbs and bake in a moderate oven for about half an hour.

Apple Custard—

6 large apples
Sugar to taste
½ cup of water
Grated rind of ½ lemon
1 oz. of butter.

Cut, peel, and core the apples, putting them in an enamel saucepan with the water. When soft, beat them to a pulp, adding the sugar, butter, and lemon rind. Put the fruit in a pie-dish and pour over, when cold, a custard made in the following proportions:—half a pint of fresh milk, 2 eggs, 1 oz. of loaf sugar. Beat the eggs well, pour the milk over them, sweeten with the sugar, and pour over the fruit. Grate a little nutmeg over the top, place the dish in a moderate oven, and bake from 25 to 35 minutes.

Wireless Talks for Farmers

WITH the co-operation of the Australian Broadcasting Commission, the Victorian Department of Agriculture is conducting a series of wireless talks on subjects of particular interest to the man on the land. These talks are being broadcast from the regional stations, 2CO (Corowa), 3GI (Gippsland), and 3WV (Horsham) on alternate Friday evenings, the 15-minute sessions commencing at 7.45 p.m.

The next talks will be on 12th and 26th January and 9th and 23rd February.

In order that these talks might be of maximum value to the farming community the Department is anxious to have the co-operation of listeners, who are invited to submit questions they would like answered over the air. If you have any particular problem connected with the management of your farm, your crops, or your live stock, or with the marketing of your produce, send a letter to Mr. J. Keane, B.Agr.Sc., Department of Agriculture, Melbourne. Your problem will then be submitted to expert officers of the Department, whose advice will be given. If you do not desire your name broadcast use initials or a nom-de-plume, but do not omit to mention your district.

Artificial Fertilizers Registered for 1940

Registrations and Unit Values

By W. C. Robertson, Chemist

FOR many years the man on the land has been advised to exercise care in the purchase of his requirements in artificial fertilizers. He has been told to familiarize himself with the brands which are registered annually at the office of the Director of Agriculture, a list of which appears in each January issue of the *Journal of the Department of Agriculture*. On no account should he purchase a brand of fertilizer which does not appear in the list* without first communicating with the Department. This does not mean that every brand which is registered, is recommended by the Department but as the application for registration is accompanied by figures representing the results of a chemical analysis of the fertilizer, which really constitutes a quality standard, steps can be taken easily to check these figures.

New fertilizer works installed at the Mildura abattoirs for the production of blood and bone. Large amounts of this fertilizer are used locally.

The Act requires that every bag or parcel containing fertilizer must have a label affixed on which the brand, including the quality guarantee, must also appear. These provisions of the Act reduce the risk involved in the purchase of fertilizer to a minimum providing the purchaser interests himself sufficiently to see (1) that the brand is registered, (2) that the bags are labelled, (3) that the quality guarantee is stated on the label, and (4) that the quality guarantee of the registered brand and that on the label coincide.

Throughout the year, stocks of artificial fertilizer in store and factory are inspected by officers of the Department of Agriculture and samples are withdrawn for analysis. While it is not suggested that every ton of fertilizer manufactured within or imported into the State is subjected to this treatment to see that it is of the guaranteed quality, the control exercised over a period of years through this work has been such that there has been limited opportunity for any wholesale adulteration, or other deliberate evasion of the Act.

These remarks apply to artificial fertilizers only. The Act does not regulate the sale of the various natural manures such as excreta from the horse, cow, pig, sheep or poultry, nor does it apply to the sale of any crude offal or other unmanufactured refuse.

Extensive trade in poultry manure is carried on between farmer and poultryman. The value per ton of this material is problematical and will

* Late registrations appear as a supplementary list in later editions of this Journal.

greatly depend upon its purity and moisture content. Clean air-dried fowl manure would contain approximately 2½ per cent. of nitrogen, 2 per cent. of phosphoric acid and 2 per cent. of potash. In decomposing, it produces about one-third its weight of humus. Its value when calculated by the unit value system would approximate £3 per ton. However, poultry manure of this description is rarely retailed and most of the article sold is so badly contaminated with foreign material that its value is reduced to less than half.

Trade in crude unmanufactured refuse is purely a matter of arrangement between buyer and seller where the buyer may often be buying a "pig in a poke," and many transactions which take place would not be permitted if the Fertilizer Act applied. However, manures of this description are mainly soil improvers and their value per ton should be assessed accordingly.

On the other hand, artificial fertilizers are essentially plant foods in concentrated form which are retailed at comparatively high prices per ton, and which could be readily and easily adulterated with cheaper materials without in any way altering the general appearance of the fertilizer to arouse the suspicion of the user. It was due to the fact that the services of the chemist in the laboratory were required to detect and prove the unfair tactics of the unscrupulous trader in this regard that the Fertilizer Act was placed on the statutes.

Sampling stocks of fertilizer in a country packing shed.

Brands Registered.

Appearing in the supplement to this issue is the main list of artificial fertilizers and the unit values for the year 1940. The list includes 161 brands. This represents an increase of approximately 10 per cent. compared with the previous year. The brands are registered by 40 manufacturers, importers or dealers, 75 per cent. of whom are manufacturers in the truest sense of the word.

For many years Australia has been able to supply her own requirements in superphosphate, animal fertilizers and, until quite recently, sulphate of ammonia. Years ago, Victoria exported sulphate of ammonia but at the present time not only is an increased output used within the State, but also appreciable quantities of the fertilizer are being imported. The local sulphate of ammonia is a by-product derived from the production of coal gas by the destructive distillation of coal whereas the salt imported is manufactured synthetically from the atmosphere.

All the potash fertilizers which are used are imported from Europe where there are immense natural deposits of crude salts of potassium. There is not any known source of potash of economic importance in Australia, although certain potash minerals may possibly prove of value in an emergency.

The quick-acting nitrogenous fertilizer nitrate of soda in which the plant food nitrogen occurs in the nitrate form, is also imported. This also applies to nitrochalk, a concentrated fertilizer, which contains nitrogen in the form of both nitrate and ammonia.

A brand for rape seed meal has been registered as a fertilizer in the vegetable meal section for the first time. This is unusual because of the high fodder analysis of the meal and the tendency in recent years to make more use of concentrates in the feeding of stock, particularly sheep.

Another fertilizer which is registered in the nitrogenous section contains all its nitrogen as hoof and treated leather. To compare the availability of the nitrogen in this fertilizer with that present in other organic fertilizers (dried

Citrus groves respond well to nitrogenous fertilizer.

blood and blood and bone), a nitrification test was conducted in the laboratory. A light sandy loam was obtained which is typical of a large area of soil under intense culture in the outer metropolitan area. This soil was incubated at a constant temperature with equal amounts of nitrogen (*a*) as blood, (*b*) as blood and bone, and (*c*) as hoof and treated (hydrolized) leather. The incubation period lasted for 6 days, 24 days, and 37 days. The soil was analysed for nitrate nitrogen at the end of each incubation with the following results :—

Equal Quantities of Nitrogen added as—	Percentage of added Nitrogen nitrified after—		
	6 days.	24 days.	37 days.
	%	%	%
Dried blood	..	50·3	63·0
Blood and bone fertilizer..	..	48·5	52·1
Nitrogenous fertilizer (containing hoof and treated leather)	..	28·3	32·7

The figures prove that the nitrogen as hoof and treated leather under similar and most favorable conditions does not nitrify as readily as the nitrogen in dried blood or in blood and bone fertilizer. It may be assumed that the longer the fertilizer is in contact with the soil the slower the rate of nitrification. Note should also be made of the fact that hoof and horn when finely ground has long been recognized as a slow acting nitrogenous fertilizer.

"Mixed" and "Complete" Fertilizers.

There is a vast difference between the terms "mixed" and "complete" as applied to artificial fertilizers. A "complete" fertilizer, insofar as concentrated artificial fertilizers are concerned, is a mixture containing two or more distinct fertilizers the admixture of which will give a homogeneous article containing the three principal plant foods, i.e., nitrogen phosphoric acid and potash in appreciable percentages and narrow ratio.

On the other hand, a "mixed" fertilizer may be anything, but generally speaking is one obtained by mixing two or more (usually two) fertilizers, having as the objective a dual purpose fertilizer, i.e., the supply of two of the principal plant foods in readily available condition. In some instances, a readily available fertilizer is mixed with one less active so that the supply of plant-food is present through the whole of the growing season. It, therefore, follows that although a "complete" fertilizer is always a mixture of fertilizers, a "mixed" fertilizer is not necessarily a complete fertilizer. For example, super. and ammonia is a "mixed" fertilizer derived by mixing sulphate of ammonia and superphosphate in varying proportion with the object of supplying appreciable amounts of ammoniacal nitrogen and soluble phosphoric acid to the crop. As it does not contain potash, it is not a "complete" fertilizer.

Super. and potash or potash super. is another illustration of a "mixed" fertilizer which has quite recently come into favour on both sides of the world, but potash and blood and bone is an example of the "complete" fertilizer, for when properly mixed a homogeneous mixture is obtained which contains the three principal plant foods, viz., nitrogen, phosphoric acid and potash—all in available form.

While on the subject of "mixed" and "complete" fertilizers it is interesting to note the similarity in the composition of the various brands registered. The reason for this is that the formulae or proportions in which the

fertilizers are mixed are based upon the knowledge gained during years of experience and actually are the agricultural chemist's answer to the demand of the practical man. They are used to correct deficiencies in the soil and thereby improve the available plant food ratio to such an extent that the crop yield is not only increased but it is also accompanied by an improvement in quality.

Unit Values.

The unit values for the current year show little variation from those of previous years, the only alterations being a slight decrease in the price of organic nitrogen and a small increase in nitrogen as ammonia. Whether existing prices will hold is problematical. Prices have been controlled in England so far (October reports) with the avoidance of any pronounced increases.

The list of registered artificial fertilizers will be found in the supplement to this issue, but since the calculation of the unit values shown therein there has been an increase in the price per ton of superphosphate and allied fertilizers.

Wheat Breeding

(*Continued from page 2*)

selection of new varieties to be carried out in the districts in which they will eventually be grown. This arrangement marks a definite advance in the breeding method, since it recognizes the fact that the reaction of different varieties to different environments is strikingly dissimilar, and the variety which will outyield all others in one district may itself be outyielded in another. An example of this is furnished by the variety Mogul, which gives consistently superior yields at Werribee, but which is so inferior to most varieties at other centres in the wheat belt, that it cannot be recommended for general cultivation.

The time has passed when any one variety can be expected to outyield all others in every district. Success in the future will depend upon the breeding of varieties for the district rather than for the State. By concentrating the efforts of the breeders in the different wheat-growing districts, therefore, the possibility of the continued production of superior varieties is greatly enhanced. That this is so has already been demonstrated by the initial success which has attended the breeding operations at the Mallee Research Station, Walpeup, where a number of crossbreds of local breeding are giving extremely promising results in yield trials.

Under the extended breeding programme, many thousands of new crossbred wheats are studied and selected annually. Every crossbred is subjected to laboratory tests in order to determine its suitability for milling and baking purposes, and all crossbreds which prove to be inferior in this regard are rejected in the early stages of breeding. By this means the grain quality of all varieties to be released to growers in the future will show an improvement over that of pre-existing varieties, and the general quality level of Victorian wheat will show an upward trend. In addition, all new crossbreds are subjected to infection tests to determine their resistance or otherwise to the disease, flag smut, which takes a tremendous annual toll of the Victorian wheat crop.

During recent years, many new crossbreds exhibiting a high degree of resistance to this scourge have been evolved. Several of these, which combine the resistant character with that of superior grain quality, and ability to yield well, are at present undergoing final yield trials.

The growing and testing of such a large number of crossbreds entail a tremendous amount of labour, both in the field and in the laboratory. The work of producing a superior variety of wheat is tedious and slow, and the breeder meets with many disappointments. Of the odd ten thousand different crossbreds which are grown each year, probably only a bare dozen will reach the stage of final yield trials. Should but one of these prove itself to be superior to the varieties already in existence, the breeder will count himself fortunate indeed.

Tuberculosis in Stock

By W. M. Lerew, G.M.V.C., Veterinary Officer.

TUBERCULOSIS, or consumption as it is generally termed when it affects the lungs of man, is a common disease among some of the lower animals, especially cattle and pigs. It is the most widely-spread stock disease known, and under conditions favoring it, may affect every animal in a herd. It is communicable from cattle to man. In such cases infection usually takes place by the use of milk of diseased cows. Pigs are also very liable to the disease, if fed on the raw milk or on the carcasses of tubercular animals. Birds may also contract the disease, though mammalian tuberculosis is not transmissible to birds.

The bacillus tuberculosis, the causal organism of the disease, is of very great vitality, and if conditions are favorable will retain its virulence for months, but if exposed to direct full sunlight it dies in a few hours. In a moist heat of 140° F. it will succumb in an hour and at 180° F. it will be killed in fifteen minutes.

Contributory Causes.

Although, of course, the tubercle bacillus must be present in order that the disease may exist, several outside influences contribute largely to the spread and virulence of an outbreak. Amongst them may be mentioned insanitary surroundings, overcrowding, insufficient nourishment, heavy milking, in-breeding, and breeding from stock that are too young. These conditions all tend to decrease bodily health, and to lower an animal's resistance. The state under which the germ flourishes is provided in dark, damp, badly ventilated sheds.

Tuberculosis is very prevalent in herds running on rich heavy flats, where the ground has a high moisture content. It is, however, comparatively rare in hill country, and in the drier northern portions of the State. Congenital tuberculosis is almost unknown. It is not until the germ is implanted, and conditions favour its development, that the disease begins.

In stock, progress is slow and insidious. The disease may be present for a long period before its presence is even suspected, and it may actually spread through the whole herd unless proper precautions are taken to check it. Practically any organ of the body may become affected, but a greater proportion of cases occurs in the intestinal glands, or in the lungs, and the glands in the chest. Other common seats of the disease are the glands round the throat, those in front of the shoulder and stifle, and the glands above the back of the udder, also the udder itself.

The characteristic lesion is a small rounded nodule which unites with other nodules to form conglomerate masses of all sizes up to 12 inches in diameter. When these tubercles, as they are called, are cut into, the contents will be found to vary from a creamy pus to a dense firm mass resembling soft ripe cheese. This latter condition is termed caseation. In advanced or chronic cases the tubercle may be hard and gritty, due to deposits of lime salts. This is referred to as calcification. In the lungs—the most common seat of infection—the tubercles may often occur in clusters, and the covering of the lungs and the lining of the chest walls become coated with fringes of false membranes containing tubercles which increase to form pale red cauliflower-like growths. These are often spoken of as "grapes."

If the infection is in the lungs (pulmonary tuberculosis), the first sign of illness will be a cough which will be greatly aggravated by any exertion. Wasting then commences, the skin becomes harsh and dry, and the old hair is not shed as soon as it should be. Gradually the animal grows thinner and weaker till death occurs.

If the abdominal organs are affected, loss of condition may be the first thing noticed, but sometimes chronic scouring is very marked. When the superficial glands are attacked, they become considerably enlarged and hardened, and are rough to the touch. This roughness is due to the tubercles actually projecting from the surface of the gland; they are painless, and rarely burst and discharge. Snoring is sometimes very pronounced when certain of the deeper throat glands are affected.

The first indication of tuberculosis in a well-fed herd will probably be that one beast will begin to lose condition, and as time goes on the decline will become more marked. This is only a general guide, for occasionally when fat

beasts are killed it is found that they have been suffering from what is called generalized tuberculosis, and the whole carcass has to be condemned.

Although advanced cases may be readily discovered, the only certain means of detecting the disease in its early stages is by the tuberculin test, which is everywhere recognized as the most reliable and efficient test known for ascertaining the presence of tuberculosis in cattle. This test may be carried out by any qualified veterinary surgeon, and while by its use affected animals, even in the early stages, may be discovered, it does not upset or harm in any way the healthy beasts which are tested.

The disease exists in every civilized country in the world and the denser the population the greater the percentage of cases; and as with man so it is in the case of animals. Therefore the best means of staying its spread is to prevent overcrowding, and to ensure exposure to a plentiful supply of fresh air and sunshine. Tuberculosis is spread amongst cattle by rearing calves on milk from the tubercular cows, or by allowing sound and diseased animals to feed out of the same receptacles, or even by permitting a tubercular beast to stay in the herd.

Where the tubercle bacillus is present, tuberculosis will spread very rapidly amongst pigs when they are confined in damp, badly ventilated sties, or if they are fed on milk or offal from tubercular cows. It is always advisable that any meat fed to pigs should be cooked thoroughly. As tuberculosis is communicable from man to animals, a tubercular person should not be employed in tending cattle or pigs.

In an individual herd, prevention may be carried out when building up the herd by introducing only animals that have been submitted to and passed the tuberculin test. The herd should be tested annually, and if a beast reacts it should be at once removed, and all feeding utensils and the shed should be disinfected. If a tubercle-free herd is maintained under proper conditions, the disease should not make its appearance, and young stock from such a herd will command a very much higher price than those from a non-tested herd.

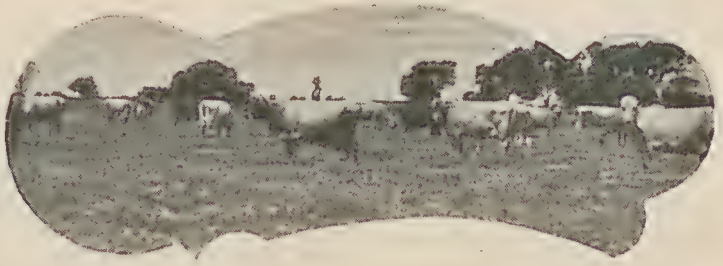
All cow-sheds should be well lighted and well ventilated, and have properly drained impervious floors. It is a precaution against tuberculosis to feed cows well, especially if they are high producers. A further precaution is to rug cows in cold weather. Calves that have always been well fed and have been reared in healthy surroundings will be much more unlikely to become tubercular than those that have been badly fed and confined in close, ill-ventilated buildings.

As milk infected with the tubercle bacillus is one of the most prolific causes of tuberculosis in man, it is strongly urged that all raw milk intended for food (except milk from certified tubercle-free cows) should be pasteurized. The method recommended is as follows:—

> The milk to be heated and retained at a temperature of not less than 145°F. and not more than 150°F. for at least half an hour and cooled immediately afterwards to a temperature of 40°F. or less.

The milk of one cow should never be specially reserved for a child, except, of course, a cow that has passed the tuberculin test. A measure of milk taken from the mixed milk of a whole herd will not give the same risk of infection as milk from an individual cow.

Both the Stock Diseases Act and the Dairy Supervision Act make it obligatory on owners to report immediately to the Department of Agriculture any outbreak of tuberculosis in their herds. By the terms of the Cattle Compensation and the Swine Compensation Acts, owners are also bound to report cases occurring in cattle or pigs, and where any animals are destroyed compensation will be paid.



Dairy Factory Effluents

By E. J. Drake, E. A. Hepburn, B.C.E., A.M.I.C.E., and R. H. N. Trembath, B.Agr.Sc.

A country butter factory.

THE problem of dealing with effluents from factories producing milk products is a pressing one throughout the world, and the industry in Victoria naturally has not been immune. The high standard of cleanliness which is essential for milk processing results in the production of large quantities of contaminated washing water. The Victorian butter and cheese factories between them discharge considerably more than 1,000,000 tons of washing water annually; in addition they produce approximately 15,000 tons of buttermilk and 6,000 tons of whey. These effluents are very liable to become putrid, and if not efficiently disposed of may be a serious menace to health. For this reason, the Department of Public Health is armed with adequate powers to prevent pollution. However, the disposal of 1,000,000 tons of liquid constitutes a very material problem which cannot be legislatively abolished, and the Department has realized the necessity for administering the law in a reasonable spirit, tendering advice more freely than prosecutions.

In 1938, at the annual conference of the United Country Party, it was resolved that the Department of Agriculture and the Commonwealth Council for Scientific and Industrial Research should be asked to co-operate in solving this problem. Similar resolutions were passed by the Gippsland Shires and Boroughs Development Association and by the Victorian Dairymen's Association. In June, 1938, consultation between the Director of Agriculture and the Executive Committee of the Council for Scientific and Industrial Research began, and it was agreed that a joint committee should be formed, and that the Victorian Department of Public Health should be invited to co-operate. This committee, consisting of Mr. E. J. Drake (C.S.I.R.), Mr. E. A. Hepburn (Department of Public Health), and Mr. R. H. N. Trembath (Department of Agriculture), held its first meeting on the 4th October, 1938. Prior to the formation of the committee, officers of the Department of Agriculture and the newly-established Information section of C.S.I.R. were engaged on collecting all published information relating to the problem and the various methods of coping with it in use or proposed in other countries. Prior to the first meeting, members of the committee had studied the results of these inquiries, and had no difficulty in coming to the following conclusions:—

(i) With regard to washing water, overseas experience shows that effective means of disposal are available, although the most satisfactory procedure varies with the individual circumstances, and in unfavorable circumstances the cost may be considerable. The problem thus resolves itself into a study of individual cases, and the application of existing knowledge to secure the least costly means of adequate treatment.

(ii) Skim milk, buttermilk, and whey are valuable by-products of the industry, which, in European countries and the United States of America, are practically never wasted. Moreover, if these materials are allowed to find their way into the effluent, the problem of disposal, except in exceptionally favorable circumstances, becomes insuperable. Of these products whey, having only approximately half the food value of the other two, is the most difficult to utilize profitably.

Since the preliminary inquiries showed that no universally applicable procedure is available, but each case requires individual study, it was evident that the committee could make no progress until it had informed itself on the conditions existing in each individual factory.

A questionnaire was therefore prepared and forwarded to the 146 butter and cheese factories in Victoria on 16th November, 1938. By 10th January, 1939, approximately one-third, or 33 per cent., of the factories had replied, and a further request was forwarded. As a result, the number of replies was raised to 60 per cent. by the 3rd March. Of the 104 replies received, fifteen stated that the factory concerned was in difficulties. (Reference to Departmental records showed that a number of those factories stating that their disposal was satisfactory were, in fact, causing a nuisance.) The fifteen factories stating that they were experiencing difficulty were invited to forward full details to enable the committee to offer advice appropriate to the circumstances. Five accepted this invitation. The first fact established by the questionnaire is that very little effort can be expected from the majority of the factory managers.

Members of the committee have visited those factories making an effort to overcome the problem, and have made available to the managers all information at their disposal. They have also visited other factories who have already met the problem successfully, and the managers of these have offered to co-operate with the committee and will make the results of their practical experience available to the industry in general. The committee greatly appreciates their co-operation.

An examination of the replies to the questionnaire shows that buttermilk and skim milk are, in practically all cases, being fully utilized. They show, however, that large quantities of whey are being discharged as waste effluent, and that the utilization or more satisfactory disposal of this material is the principal problem. While the primary objective of the committee is the prevention of nuisance, the members feel that their task will not be adequately discharged until this material can be directed into profitable use, since whey represents approximately 30 per cent. of the total food value of the original milk. Where practicable, direct feeding to pigs is the simplest and most satisfactory solution of the problem, and there is evidence that there is still room for a very great expansion of this industry.

An examination of the methods in successful operation in Victoria for the disposal of effluent shows that they follow the same general lines as those employed abroad. Where a sufficient area of gently-sloping land with an absorbent soil is available, washing water can be satisfactorily disposed of, after adequate grease-trapping, by rotational application to pasture with considerable benefit to the quality and quantity of the pasture. The results of irrigation of cultivated land have been generally unfavorable, as the very frequent cultivation necessary to prevent the caking of the surface and the clogging of its pores with grease is seldom carried out; and moreover, no return is obtained from the land.

Where the soil is non-absorbent, promising results are being obtained from "grass filtration," the grease-trapped drainage being allowed to flow in a shallow layer for 10 chains or more through the grass, and to escape into a drain or water-course at the lower edge of the field. The essential points in this method are the filling-in of any hollows in which the drainage forms pools and submerges the grass, a low velocity so that the grass is not "laid," change of the point of application at least twice weekly, and grazing of the pastures, preferably by sheep.

In cases where either of the above methods is not practicable, oxidation of the drainage on trickling filters, as used in sewage treatment works, is an effective method of treatment if filtration is preceded by efficient grease-trapping or chemical precipitation, and followed by a sedimentation tank to remove from the effluent the solid matter which passes out of the filter. Chemical precipitation alone will purify washing water to an extent of 50 per cent. or more, but not sufficiently to permit of its discharge into a stream.

[*Continued on page* 31.

All-Australian Pig Carcass Competitions

THE results of the latest All-Australian Pig Carcass Competitions judged in London in June, 1939, have now been released by the Australian Meat Board, which sponsors these valuable contests. In commenting on the detailed results, Mr. L. A. Downey, Pig Expert of the Department, points out that pig carcasses in these competitions are appraised on the approved standard of measurements and photographs by a committee appointed in London. The detailed measurements and marks give breeders a true measure of the quality of their pigs and provide material for progressive improvement in breeding and feeding operations.

The marking standard is severe and 60 per cent. is considered a good score, while 80 per cent. or more is rarely attained. A study of the standards and the scores of the individual pigs will show readers that the pigs required for the export trade are long in the body, carry and abundance of lean meat as measured in the "eye" of loin muscle, and a comparatively light covering of back fat.

Several breeds were represented, either as purebreds or crosses, but the Large White predominated.

Baconers.

There were seventeen entries in the baconer section, only one coming from Victoria. This entry of Large Whites from Messrs. Trenery and Soderland, Promview Stud, Foster, scored very well with a total of 80 per cent. and was placed fourth. The three pigs in the entry scored consistently well. The scores of the individual pigs in the winning entry from South Australia and in the Victorian entry are given below.

Porkers.

Of the eighteen entries in the porker class two came from Victoria, the owners being Longerenong Agricultural College, whose entry of Large Whites scored 65.22 per cent., and Mr. J. T. Tweedle, Pine Lodge, Harkaway, whose Middle Whites scored 63.18 per cent. The winning entry in the porker class was that of Mr. Otto F. Haack, Queensland, whose Tamworth x Middle Whites scored 80.29 per cent. The individual scores and measurements of the winning entry and the two Victorian entries are given below.

AUSTRALIAN MEAT BOARD—BACONER COMPETITION.

Entrant. Breeding of Entry.	Weight in lb.	"A" Marketing Points.			"B" Breeders' Points.																"C" 15 Suitability of Carcass Weight.	Total "A," "B" and "C" 125.	Marks.
					By Inspection.			By Measurement. (Millimeters.) (25 mm. = 1 inch.)																
								Eye Muscle 28.			Fat Thickness 20.			Body Length 20.			Leg Length 5.						
		Skin 5.	Dressing 5.	Total 10.	Hams 8.	Shoulders 7.	Streak 12.	Ideal.	Actual.	Points.	Ideal.	Actual.	Points.	Ideal.	Actual.	Points.	Ideal.	Actual.	Points.	Total 100.			
																							%
Inspector-General of Hospitals, Bedford Park, Entry No. 12	141	5	5	10	6	5	10	54	53	27	20	21	19	805	750	9	559	543	5	91	15	106	84·8
	149	5	5	10	7	4	9	54	54	28	20	20	20	815	756	8	564	538	5	91	15	106	84·8
	155	5	5	10	7	3	11	54	58	28	21	22	19	835	765	6	574	542	5	89	14	103	82·4
Large White x Berkshire	%	..	..	100	83·33	57·14	83·33	..	..	98·81	..	..	96·66	..	..	38·33	..	..	100	90·33	97·77	(315)	84·0
Trenery and Soderland, "Promview," Foster, Entry No. 1	135	5	5	10	6	3	7	53	43	18	19	23	16	795	773	16	554	563	4	80	15	95	76·0
	152	5	5	10	6	5	8	54	50	24	21	21	20	825	804	16	569	598	2	91	15	106	84·8
	151	5	5	10	6	4	9	54	50	24	21	18	17	825	785	12	569	590	2	84	15	99	79·2
Large White x Large White	%	100	100	100	75·0	57·14	66·66	..	..	78·57	..	..	83·33	..	..	73·83	..	..	53·3	85·0	100	(300)	80·0

AUSTALIAN MEAT BOARD—PORKER COMPETITION.

Entrant. Breeding of Entry.	Weight in lb.	"A" Marketing Points.				"B" Breeders' Points.																Total 100.	Total "A" and "B" 115.	Marks.
						By Inspection.			By Measurement. (Millimeters.) (25 mm. = 1 inch.)															
									Eye Muscle 28.			Fat Thickness 20.			Body Length 20.			Leg Length 5.					
		Skin 5.	Colour 5.	Dressing 5.	Total 15.	Hams 8.	Shoulders 7.	Streaks 12.	Ideal.	Actual.	Points.	Ideal.	Actual.	Points.	Ideal.	Actual.	Points.	Ideal.	Actual.	Points.				
Otto F. Haack, Beenleigh, Entry No. 2	63	5	5	5	15	5	5	8	44	37	21	9	11	18	645	615	14	419	457	1	72	87	% 75·65
	74	5	5	5	15	6	5	9	46	43	25	10	9	19	665	650	17	439	485	1	82	97	84·34
	74	5	5	5	15	6	5	8	46	44	26	10	12	18	665	630	13	439	465	2	78	93	80·87
Tamworth x Middle White	%	..	..	..	100	70·83	71·43	69·44	..	..	85·71	..	..	91·07	..	..	73·33	..	..	26·66	77·33	(277)	80·29
Longerenong Agricultural College, Entry No. 1	79	5	5	5	15	5	5	7	47	34	15	10	18	4	675	650	15	449	505	1	52	67	58·26
	83	5	5	5	15	5	5	5	48	34	14	11	17	10	685	675	18	459	512	1	59	73	63·47
	84	5	5	5	15	6	5	6	48	33	13	11	12	19	685	685	20	459	498	1	70	85	73·19
Large White x Large White	%	..	..	..	100	66·66	71·43	50·0	..	..	50·00	..	..	55·00	..	..	88·33	..	..	20·00	60·00	(225)	65·22
J. T. Tweedle, Pine Lodge, Harkaway, Entry No. 1	88	5	4	5	14	6	4	7	49	35	14	11	17	10	695	655	12	469	462	5	58	72	62·6
	74	5	4	5	14	7	5	6	46	33	15	10	13	16	665	610	9	439	425	5	63	77	66·95
	68	5	4	5	14	5	6	6	45	30	13	9	14	12	655	610	11	429	440	3	56	70	60·87
Middle White x Middle White	%	..	..	..	93·33	75·0	71·43	52·77	..	..	50·00	..	..	63·33	..	..	53·33	..	..	86·66	59·00	(219)	63·18

Dairy Factory Effluents

(*Continued from page 29*)

The committee has collected much information on the subject of feeding whey to pigs, and will be pleased to make it available to any one interested. It is doubtful, however, whether pig raising will completely solve the problem of surplus whey, and the possibility of feeding to other animals is being investigated. At one factory, calves are being successfully raised on whey with a limited amount of grazing. This procedure has the advantage that the maximum demand coincides with the period of maximum supply.

An experiment on the feeding of the material to milking cows is also being planned, and an attempt is being made to develop an inexpensive form of concentrating plant. It is expected that this plant will make it possible to produce whey paste containing about 50 per cent. solids at a cost of approximately £2 per ton, at which cost it will compare very favorably with other feeding materials available for pigs. The plant under consideration is a direct fired evaporator burning wood, and will be comparatively inexpensive to instal. Provided the product is palatable, the installation of plants of this type may contribute materially to the solution of the whey problem.

Apart from animal feeding, the most satisfactory method of disposal is by carefully spreading on pasture. While this procedure is inferior from the point of view of utilization, it, at least, recovers the fertilizer value of the material. The potassium and phosphate contents are almost completely utilized, and a large proportion of the protein should become available. The amount of available nitrogen will probably depend on a number of circumstances, such as the pH value, the amount of available oxygen, and the frequency and rates of application.

Experiments on whey spray irrigation at the School of Dairy Technology, Werribee, with a view to obtaining further data on this method of disposal, are also being planned.

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor.

Orchard Notes.

ALTHOUGH the numbers of codling moths on the wing may not be large during January because this is a period between the "peak" flights, growers should take the opportunity to examine chemical bands to observe their effectiveness. Occasional bands, throughout the orchard, should be taken from the trees and thoroughly examined for the number of empty cocoons and pupae cases. Where it is noticed that more than about 5 per cent. of the hibernating larvae and pupae is escaping as moths, new bands should be placed on the trees. The attention of growers is drawn to the situation of lure charts and spray advice services in their districts, and, if there is any doubt about the time of application of sprays, or any other information which the grower requires to assist him in conducting his orchard, he should communicate, by letter or telephone, with the local orchard supervisor.

Apricot picking will continue during January, and the later varieties, such as Tilton, Alsace, Rose de Vaucluse, and some Moorparks, will be harvested in some districts. Shot hole and scab in apricots have been more prevalent this year, and growers who have experienced trouble with the fungous disease causing these symptoms should make provision for the application of a 6:4:40 Bordeaux mixture spray during the following May. Where infection from this disease is severe, it is necessary to apply a Bordeaux mixture spray at, or about, leaf fall and again when the blossom buds show "pink" in the spring.

Passion fruit will be harvested in the North-east districts towards the end of the month and in order to prevent shrivelling of this fruit, it should be harvested in the early morning and protected from heat and wind. If covered with wet bags, shrivelling will be retarded. A waxing process is being developed which will retard shrivelling and allow the fruit to be marketed in a fresh-looking condition. A new packing chart for passion fruit has been issued and is available free on application to this Department. The packing of passion fruit in four cases is set out on this chart—the Long Bushel, the Half Long Bushel, the Half Dump, and the Half Standard are those recommended.

The control of red scale on citrus trees will require attention during the month and, where possible, fumigation with some form of hydrocyanic acid gas is recommended. Growers who are unable to fumigate should spray with white oil emulsion at a strength of 1 in 40. Sufficient spray should be used to thoroughly wet all parts of the tree. It is false economy to try and make a vat of spray do more trees than it should.

Some early maturing almonds may be harvested towards the end of the month and growers should endeavour to harvest the varieties separately. Before packing, the nuts should be spread in the sun to dry thoroughly, and as many of the hulls and as much rubbish as possible should be separated from them. A good clean sample is always more attractive to the buyer. After packing, label each bag with the name of the variety.

In this issue of the Journal, there appears information on the unit value of fertilizers. In addition, a complete list of the registered fertilizers and their composition will be found in the supplement to this issue. Growers should study this information carefully and learn to work out for themselves the value of the fertilizer they intend to apply.

Growers who have not thinned their heavy crops of apples and pears, particularly the late varieties, should do so, as early as possible. The market will find it difficult to absorb extremely small fruit because of the large amount of high quality fruit which will be available. Attention to cultivation and irrigation will also assist in producing good quality fruit, and it will be this quality fruit which will be sold most easily on the market.

The Flower Garden

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed. Principal, School of Horticulture, Burnley

ALTHOUGH the main work in the garden during January will consist of watering, hoeing and looking after the summer annuals, it must not be forgotten that this is also the time to sow the seeds of the winter flowering annuals. When watering, it is advisable to give a thorough soaking, and as soon as the ground is sufficiently dry, stir the first half-inch or so with the Dutch hoe. This prevents the surface from setting hard, helps to keep in the moisture, and assists the water to enter more freely at the next watering.

If it is possible to procure some stable manure top-dress the dahlias and such plants with it. The straw in this material greatly assists in keeping the ground at a more even temperature and permits watering without puddling the surface.

Roses should be gone over and all spent flowers removed. They should be cut off just above a strong looking bud, and preferably one on the outside of the stem. Give the rose bed a top-dressing, and every week or so, a good watering. The dahlias should be ready for tying up to the stakes. Commence disbudding according to the varieties and the purpose for which the flowers are grown. The Charm types require little or no disbudding, except where long stems are desired.

Make a final sowing of gladiolus for April–May flowering. Plant seeds of such winter flowering plants as the calendula, Iceland poppy, viola, winter-flowering stock, pansy, winter flowering sweet peas, antirrhinums, sweet william, carnation, and dianthus. Divide up and re-plant violets and prepare the ground for planting daffodils, bearded iris, tulips, freezias and such like.

A Cactus dahlia.

Make sowings of cineraria and primula in a seed box that can be sheltered from the sun, as these plants will not withstand the strong sun during any stage of their development. Select a good sheltered spot in which to transplant them,

and one which allows them to be easily covered during the frosty nights, if not otherwise protected.

Special care should be taken in sowing the seed of these winter flowering plants. Seed of any kind sown this month requires special attention. Prepare the area thoroughly and before sowing, give the ground a good watering. After sowing, cover the seeds according to their size. The small seeds, such as poppy and antirrhinum should be just covered with a light soil and then, if available, some sifted stable manure used, as a top dressing. The manure prevents the surface from setting hard after watering and helps to keep in the moisture. When watering, use a watering can with a fine rose, in order to disturb the soil as little as possible.

To protect from the direct rays of the sun, place some wire netting over the bed, and on this some branches of light foliage, such as small wattle branches or bracken fern, if available. This also prevents the birds from scratching after the seeds. The bed should be watered daily, and as the seedlings develop, the cover may be removed gradually to enable them to harden off before transplanting. Always grow seedlings in the open, if they will withstand such conditions, as they are hardier and "get away" better when transplanted, than do seedlings grown in bush houses or such places.

Transplant poppies from now until April, and the sooner the better. This enables them to become well established before the cold weather, and if the blooms are kept well picked, they will flower until the spring.

Vegetables.

The season has been very good for the growing of vegetables, but the cool weather in November did not assist the tomato, cucumber and such summer growing crops. Now that they are growing well, give them a top-dressing of farmyard manure, but if that is not available, use market garden or any other suitable fertilizer, at the rate of about 2 oz. per plant.

Make further plantings of French beans, lettuce, radish and peas. Make sowings of cabbage and cauliflower seeds of the early types. It is essential to grow the varieties that are suitable to the season, as a good many failures are no doubt brought about by sowing out of season. When sown at the wrong time of the year, the plants often prematurely run to seed. Good early varieties of cauliflower to sow from now until April are, Sensation, Early Eclipse, and Early Phenomenal. Transplant the seedlings as soon as they are large enough to handle conveniently.

Reliable early cabbages are—Eastham, Best of All, Enfield Market and Early York. These early types are not so large as the later varieties, but ripen in about four months, whereas the later types take from five to six months. The pumpkins, melons and cucumbers should be setting their fruits freely now. If they are not, try pinching back the runners. This usually checks the flow of sap and causes the flowers to set better. Cucumbers should be picked from the vines as soon as they are old enough to use. By so doing, the plants will go on producing much longer than if they are allowed to ripen and remain on the plant.

Picking vegetables at the correct stage of development is very important, but unfortunately, many growers allow them to ripen too much before gathering them. This is sometimes due to the fact that one likes to have larger sized vegetables or it may be because too many were sown at the same time. The only way to know the right time to pick is to watch the growth closely, and as a general rule, immature picking is better than over mature, particularly with beans, cucumbers and root crops.

Rotational sowing is very important, and the home gardener should know that the time between sowings is governed by the time of the year and the picking period for the particular crops, e.g., French beans will last about one month from the time they are ready to use until the time they stop bearing. Therefore, make monthly sowings during the season from September until early March. If small rotational sowings are carried out, the value of the vegetable patch will be greatly increased.

Sugar Beet Diseases

Progress Report of Investigations

By C. R. Millikan, M.Agr.Sc., Plant Pathologist

SINCE the season 1934-35, surveys have been conducted to determine the relative importance of the diseases occurring in the sugar beet crops in the Maffra and Lindenow districts of Victoria. The results of this work are set out below.

Experimental work on the control of the principal sugar beet diseases was initiated at the Plant Research Laboratory, Burnley, and on an experimental area at Maffra in the season 1936-37.

Black Leg.

Black leg, a condition affecting the germinating and young seedlings only of the sugar beet, occurs in the Maffra area. Its prevalence varies from season to season. It is characterized by the presence of black areas on the stems of the seedlings just below ground level. Plants so affected show retarded growth, or in severe cases, may even die before breaking through the surface of the ground.

An examination of plants from the Maffra district affected with black leg has often revealed the presence of the fungus *Phoma betae* in the discoloured portions of the stem. Overseas work has indicated, however, that this fungus is not the primary cause of black leg, although it may play an important secondary role. Unfavorable conditions for rapid germination, such as very wet, cold weather, or on the other hand, very dry weather, favour the development of the disease. Growers sometimes tend to cultivate their areas to too fine a tilth, which often leads to the formation, after sowing of a hard surface crust through which the germinating beet seedlings find it difficult to penetrate. This is also conducive to the development of black leg. Again, a deleterious effect on germination and early growth favoring the disease is often caused by farmers applying excessive quantities of superphosphate to the ground with the seed.

These factors, together with a low rate of seeding per acre, have been the principal causes of instances of poor "strike" associated with the free occurrence of black leg in sugar beet crops in the Maffra district, where this disease is relatively unimportant; any isolated plants in a crop which may be affected are usually removed during thinning.

Although *Phoma betae*, the fungus associated with black leg, is often carried on the sugar beet seed, experiments described later in this report have not indicated that it is an economic procedure under Maffra conditions to disinfect the seed to control this organism.

Leaf Spot.

Leaf spot disease, caused by *Cercospora beticola*, was found to be prevalent in the sugar beet crops. This disease, which was first recorded in Victoria in 1922, is characterized by the occurrence of small spots which have an ashen-grey centre and a red border on the leaves (Fig. 1).

Fig. 1.—Leaf spot of sugar beet caused by **Cercospora beticola.**

Fig. 2.—Beet plant severely affected with leaf spot showing the destruction of all the leaves. Rotting at the end of the tap root has commenced.

Individual spots are more or less, round and never more than approximately one-eighth of an inch in diameter, but they may be so numerous as to occupy practically the entire leaf surface. In such cases, the leaf usually succumbs to the attack of the fungus. The outer leaves are generally first affected in this way, but under conditions favorable to the development of the disease the inner leaves are also destroyed (Fig. 2). The plant then produces a fresh crop of leaves which may again be destroyed by the fungus. Instances have been noted where as many as three separate crops of leaves have been destroyed by the leaf spot fungus. In such cases, the beet finally becomes exhausted and may rot in the ground. Even if rotting does not occur, the roots are small in size and their sugar content is reduced.

The new leaves are produced from the crown of the plant, which often becomes elongated and conical. The browning of the foliage caused by this disease has often been erroneously attributed by growers to burning by the hot summer sun.

An important method of carry-over of the leaf spot fungus from season to season is by means of the spores produced in the infected leaves. Such leaves fall to the ground, and spores may remain in the soil in a viable condition for several years. The practice of ploughing this diseased material into the soil therefore constitutes a menace for succeeding beet crops grown on that area. This fact has been strikingly demonstrated in both the Maffra and Lindenow districts, where the most severe attacks of leaf spot were found to occur in the second or third successive crops on the same area. In some instances, half a paddock has been under beet for two consecutive years, and the other half sown to beet following oats. The latter crop in such cases has shown a much less severe leaf spot infection, particularly in the early part of the season.

The spores of *Cercospora beticola* may be carried by the wind, so that during the latter part of the season the disease may spread from diseased to neighbouring healthy crops by this means. European experience has also shown that the spores of the fungus may be carried on the seed.

Leaf spot disease was found to be present to a greater or lesser extent in every crop inspected, but in most cases, it appeared late

Fig. 3.—Sugar beet leaves infected with **Cercospora beticola** *and* **Phoma betae**—*two types of leaf spot disease.*

in the season and often did not result in any severe damage. High temperature and high humidity favour the development of leaf spot, and in the absence of such conditions the disease is of minor importance only.

Cercospora beticola has also been recorded on mangolds and fat hen (*Chenopodium album*), a common weed growing in the sugar beet areas. This fact is important as it ensures the carry-over of the fungus from season to season in the absence of the beet plant.

Another type of leaf spot disease caused by *Phoma betae* was found to occur in the sugar beet. This disease is not so prevalent as cercospora leaf spot and is readily distinguishable from the latter, as the spots occupy a much larger area, are dark in colour without any red border, and often show concentric markings (Fig. 3).

Fig. 4.—Leaf spots of sugar beet produced by artificial inoculation with Cercospora beticola *(left) and* Phoma betae *(right).*

Rust.

Rust, caused by the fungus *Uromyces betae*, occurs on the leaves of sugar beet. This disease may be recognized by the occurrence of small orange-red to brown pustules on either surface of the leaf. As it is of relatively small significance, however, no special precautions are considered necessary to combat it.

Crown Gall.

Occasionally, during lifting and topping operations, beets showing large excrescences on the side, near the crown, are seen (Fig. 5). These outgrowths usually have a very convuluted surface, and are relatively hard in texture.

The condition is known as crown gall, and is caused by *Bacterium tumaefaciens*. It has no economic importance.

"White Leaves."

A relatively rare condition, sometimes referred to as "white leaves," has been recorded in beet at Maffra. As its name suggests, the characteristic symptom of this disease is the complete absence of green pigment, particularly from the centre leaves (Fig. 6). The roots of affected plants may be reduced in size. The condition is a physiological disease, unassociated with any parasitic organism, but its exact nature is unknown.

Beet Eelworm.

In December, 1935, the beet eelworm (*Heterodera schachtii*) was first recorded on sugar beet growing in one small area at Maffra. Since that date, no further instances of beet crops attacked by this organism have been discovered.

In European countries, the beet eelworm is responsible for a very serious condition known as "beet sickness," and where an area has become heavily infested with the pest, it has been found impossible to grow profitable beet crops. In view of its serious nature, growers should acquaint themselves with the symptoms of this disease so that they will be able to recognize it should it appear in their crops.

Often the first noticeable indication of the presence of the beet eelworm is that small patches of beet become backward in growth and wilt badly during the hot summer days. If such plants are pulled up and examined, it will be found that the tap root is small and is generally covered with numerous small "hunger roots" (Fig. 7).

If these roots be examined closely, the small white to brown lemon-shaped cysts of the eelworm will be seen (Fig. 8). Although these cysts, which are the mature female worm, are only half the size of a pin's head, each may contain several hundred eggs. In the absence of a suitable host plant, the eggs may remain in a viable condition in the cyst for several years, indicating the great difficulty of ridding an area of the pest once it is infested with it.

On infested land, experience in Europe has shown that profitable crops of beet can be grown only by adopting a rotational system which includes sugar beet not more than once every five to seven years.

Growers should not confuse this disease with the root aphis which is very prevalent in the sugar beet areas. Like the beet eelworm, attacks by the aphis also induce the production of "hunger roots," and renders the plant liable to wilting during hot weather. The aphis is readily distinguished, however, by the white cottony material which it always produces. In addition, the aphis itself is bigger in size, and is usually a blue-grey colour.

Fig. 5.—Crown gall on sugar beet.

Fig. 6.—Sugar beet showing a complete absence of green pigment in the centre leaves.

Excess Water.

Where careful control has not been exercised over irrigation water, or where the beet has been sown on areas liable to water-logging, growers have experienced trouble in the form of severe rotting of the tap root. This rotting usually commences at the bottom, but quickly involves the whole beet. This indicates that the beet is very sensitive to excess soil moisture, which prevents the proper aeration of the soil.

Fig. 7.—Sugar beet attacked by the beet eelworm showing production of numerous "hunger roots."
[After *Min. Agr. and Fish.*

Mineral Deficiencies.

It is convenient to consider the occurrence of mineral deficiencies in sugar beet in the Maffra and Lindenow districts in conjunction with greenhouse and field experimental work designed to determine the nature of such deficiencies. For some years, certain foliar symptoms, described later, have been observed in sugar beet plants growing in the Maffra district. As numerous attempts to isolate a pathogenic organism from affected plants had failed, it was considered probable that the condition was a physiological disease, associated with the inability of the plant to obtain an adequate supply of some essential element from the soil.

To investigate this possibility, beets were grown in sand cultures in the greenhouse at the Plant Research Laboratory, Burnley, to study the effects of deficiencies of calcium, boron, nitrogen, phosphorous, and magnesium in the nutrient solution supplied, on the growth of the sugar beet. Glazed earthenware pots 20½ inches deep and 9 inches in diameter were used for these experiments, and the sand was washed nine times with tap water and leached with distilled water before use. It is hoped that this work will ultimately assist in determining the nature of the "beet sickness" occurring in the sugar beet areas, associated with the cropping of the same area with beet for two or more consecutive years, as the poor growth of plants on "beet-sick" land was often not attributable to any parasitic cause.

TABLE I.—RESULTS OF SUGAR BEET FIELD MINERAL TREATMENT EXPERIMENTS AT MAFFRA, 1936-38.

Treatment per acre.	Beet Yield.	Sugar.	Sugar Yield.
	Tons/ac.	%	Tons/ac.
EXPERIMENT No. 1—1936-37.			
Untreated	5·13	14·8	0·76
Super., 2 cwt.	8·96	14·5	1·30
Blood and Bone, 2 cwt.	8·32	14·7	1·22
Super., 2 cwt. + Borax 25 lb.	9·79	14·8	1·45
Super., 2 cwt. + Pot. permanganate, 40 lb.	10·65	14·9	1·59
Difference for Significance	1·18	N.S.	0.19
EXPERIMENT No. 2—1937-38.			
Untreated	9·52	13·3	1·272
Super., 2 cwt.	15·60	13·0	2·028
Super., 2 cwt. + Manganese sulphate, 56 lb.	14·14	13·6	1·918
Super., 2 cwt. + Pot. permanganate, 40 lb.	15·04	13·7	2·057
Super., 2 cwt. + Borax, 12 lb.	13·69	13·3	1·833
Super., 2 cwt. + Magnesium sulphate, 30 lb.	15·84	13·3	2·101
Super., 2 cwt. + Copper sulphate, 5 lb.	15·31	13·2	2·012
Super., 2 cwt. + Zinc sulphate, 15 lb.	15·30	13·5	2·022
Super., 2 cwt. + Sodium nitrate, 1 cwt.	12·58	13·3	1·674
Super., 2 cwt. + Pot. sulphate, 1 cwt.	13·48	13·4	1·801
*Mineral mixture	14·21	13·3	1·909
Difference for Significance	1·868	N.S.	0·283

* The mineral mixture consisted of Super., 2 cwt. + Borax, 9 lb. + Zinc sulphate, 6 lb. + Copper sulphate, 2 lb. + Magnesium sulphate, 5 lb. + Pot. permanganate, 16 lb.

Fig. 8.—White lemon-shaped cysts of the eelworm on rootlets.
[After *Min. Agr. and Fish.*

Fig. 9.—Sugar beet showing severe calcium deficiency symptoms. Centre leaves are dead.

In addition to the sand culture work, complementary field mineral treatment experiments have been conducted on an experimental area on the farm of Messrs. McLean Brothers, Maffra, since 1936-37. The yields obtained are summarized in Table I. The individual plots in these experiments were 0.0218 acres in area, and each treatment was replicated three times. At harvest, three samples were obtained from each plot for sugar analysis.

In 1936-37 and 1937-38, all manure and minerals were applied at sowing, with the beet drill. It was found, however, that this practice had a deleterious effect on germination. In 1938-39, an experiment was sown in which all manure and minerals were applied to the ground before seeding, by means of a grain drill. In addition, the treatments were designed to obtain confirmatory evidence on a number of points. Unfortunately, however, severe drought conditions were experienced in that season with the consequence that the beets failed to develop and no results were obtained.

Details of the symptoms resulting from the various mineral deficiency treatments included in the Burnley sand culture experiments are set out below. In addition, brief notes are given regarding the occurrence of deficiencies in the field.

Calcium Deficiency.

Under conditions of extreme calcium deficiency, the tops of the centre leaves of the plant began to develop a brown colour within six weeks after germination. Three weeks later, the whole of the centre leaves of the plant were dead (Fig. 9) and the plant made no further growth.

Fig. 10.—Calcium deficiency of sugar beet showing necrosis (death) of tips of inner leaves.

Fig. 11.—Inner leaf of a calcium-deficient beet plant, showing the beginning of necrosis (death) from the tip.

Where the deficiency of calcium was not so great, the growth and general appearance of the plants were, in some instances, superior to that of the controls for approximately eleven weeks after germination. From this stage, however, the centre leaves of the plants became dark green in colour and puckered, while the edges rolled in slightly.

Shortly afterwards, the top edges of the leaves became pale-green in colour and commenced to blacken at the tip (Figs. 10 and 11). This blackening progressed downwards from the tip along the edges of the leaf until the whole of the pale-green area became necrotic or dead. The root development of these plants was somewhat inferior to that of the plants receiving the complete nutrient solution (Fig. 18), and their sugar (sucrose) content was 13.4 per cent. as compared with 14.0 per cent in the controls.

These symptoms of calcium deficiency are identical with foliar symptoms, unassociated with any pathogenic organism, which have been observed in sugar beet plants grown in certain areas in the Maffra district. The plants concerned show apparently normal growth for approximately two to three months after germination, after which time the young centre leaves develop a dark-green colour and become very puckered. At the same time, the tips and upper edges become pale-green in colour and later necrosis (or death) commences from the tip (Fig. 12). Affected plants show a tendency to wilt readily during the hot summer days. These symptoms on the leaves are accompanied by a reduction in the size of the beets, which may otherwise appear normal. Analyses have shown, however, that the sugar content of affected beets is reduced. In severe cases the beet may rot in the ground.

Fig. 13.—Applying lime to an area at Maffra before cropping with sugar beet.

The Maffra soil has an acid reaction (approx. pH 5.7), and experience in this district has shown that where lime is applied to the soil before cropping (Fig. 13), a beneficial effect on the yield of beet has resulted. Crops treated with lime have also not shown any evidence of the leaf symptoms of calcium deficiency described above.

Large quantities of lime scum are produced each year as a by-product from the operations of the beet sugar factory at Maffra, and this material has been found to be very suitable to apply to beet land. Where symptoms of calcium deficiency are found to occur in a beet crop, the grower should therefore treat the area with a dressing of at least 20 cwt. per acre of lime scum or with agricultural lime before cropping the area again with the beet.

Fig. 12.—Sugar beet plant from the field at Maffra showing calcium deficiency symptoms. Note necrosis (death) of tips of inner leaves.

Boron Deficiency.

Very marked symptoms developed in the plants receiving no boron in the nutrient solution. After four weeks the plants were noticeably backward, darker green than normal, and the edges of the leaves showed a tendency to be crinkled. One week later, first signs of blackening, in the form of light-brown to darker patches beneath the surface, developed on the upper sides of the leaf stalks and lower portion of the mid-ribs of the centre leaves (Fig. 14). The lower lateral veins of these leaves were also sometimes blackened,

Later the leaf stalk split along the whole of the upper surface and the blackened tissue was exposed. The sides of the leaf stalk often split as well, while the stalks became very

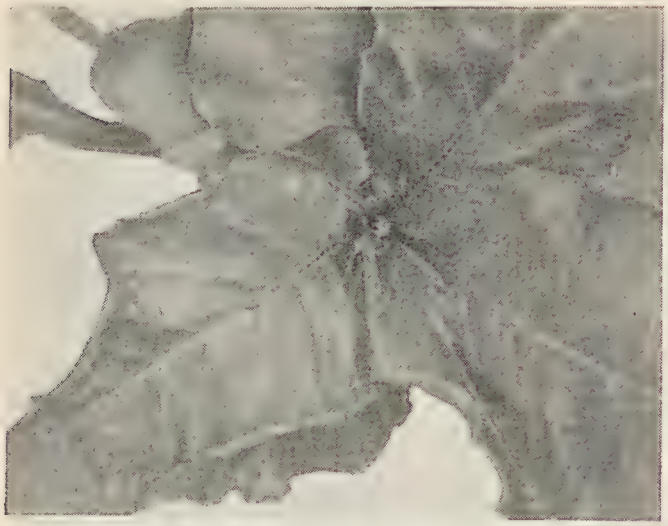


Fig. 14.—First symptoms of boron deficiency in sugar beet. Note the necrotic spots on the lower portions of the mid-ribs of the centre leaves.

brittle. The affected centre leaves soon became quite black and necrotic, and ill-formed secondary leaves developed from the centre of the effected crown (Fig. 15). At this stage the general development was very retarded, and the plants were rosetted in appearance compared with those receiving the complete nutrient solution (Fig. 16).

The roots of the plant were very much reduced in size (Fig. 18), and in some instances showed a brown discoloration in the crown. Their sugar content was 6.1 per cent. compared with 14.0 per cent. in the roots of the control plants.

In overseas countries, severe symptoms of heart rot in sugar beets associated with boron deficiency occur in the field, and are cured by applications of borax. Although rotting of beet occurs in the field at Maffra, it has not been possible to relate this symptom with a deficiency of boron and, in addition, none of the leaf symptoms described above has been noted as yet in the field.

Borax at the rate of 12lb. per acre in conjunction with superphosphate has been applied in the field at Maffra (Table I.). This treatment had a deleterious effect on germination, although the remaining beets recovered very well, and were, according to an experienced topper, more solid to the topping knife than those beets which received superphosphate only. Boron deficiency in other countries usually is associated with a neutral or alkaline soil reaction, and is accentuated by liming. It may be expected, therefore, that a greater response to applications of borax may result on areas in the Maffra district, which have been limed to prevent the development of calcium deficiency in the beet.

Further experiments will be necessary, therefore, before the efficacy of applications of borax, particularly in conjunction with liming, in promoting an improvement in the growth of beet in the Maffra district can be established.

Nitrogen Deficiency.

Three weeks after germination, plants subjected to a deficiency of nitrogen in the Burnley experiment were noticeably backward compared with the complete solution plants, and showed a general slightly pale-green colour. After this date growth practically ceased, and the pale-green colour became more marked (Fig. 17). All the nitrogen-deficient plants were still alive at the end of the experiment, but the root growth was very much reduced (Fig. 18). No evidence of any marked response to nitrogen applications has yet been obtained in the field. Nitrate of soda, 1 cwt.

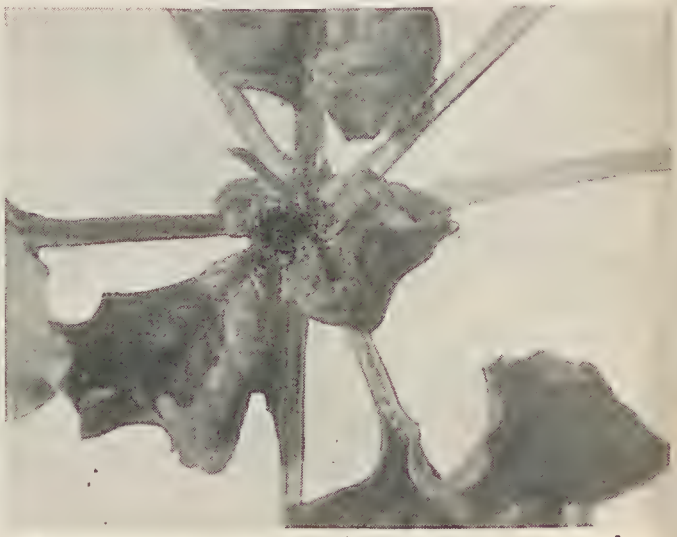


Fig. 15.—An advanced stage of boron deficiency in sugar beet.

per acre, plus superphosphate applied with the seed, had a very deleterious effect on germination and early growth (Table I.).

Phosphorus Deficiency.

Under a phosphorus deficiency treatment in the sand cultures, growth was noticeably backward three weeks after germination. The plants, at this stage, were darker green in colour than the controls, and the stems were

Fig. 16.—Left, boron-deficient sugar beet plant; Right, plant receiving boron.

slightly tinged with red. No further growth took place (Fig. 17), and after ten weeks the plants began to die. At the end of the experiment only one very small, dark-green plant remained, which showed very little root development (Fig. 18). The sugar content estimated for this beet was 19.0 per cent. compared with 14.0 per cent. in the controls. This result is probably unreliable, however, owing to the small sample available for analysis.

In the field at Maffra, applications of 2 cwt. of superphosphate per acre have resulted in an increase in yield of up to 60 per cent. (Table I.). It has been observed, however, that where this quantity of superphosphate is applied with the beet drill at sowing time, a harmful effect on the early growth of the beet results, compared with that of untreated plants. To

Fig. 17.—Sugar beet plants grown in sand culture tests at Burnley. The treatments were: Left, nitrogen deficiency; Centre complete solution; Right, phosphorus deficiency.

overcome this, the greater part of the superphosphate should be applied to the ground before sowing time, by means of a grain drill, which distributes the fertilizer in the ground to a greater extent than does the beet drill (Fig. 19). At sowing, a maximum of 40 lb. per acre of superphosphate should be applied with the seed.

Potassium Deficiency.

After four weeks, the plants growing under conditions of potash deficiency became backward in growth and somewhat rosetted in appearance. Soon after, the basal leaves of

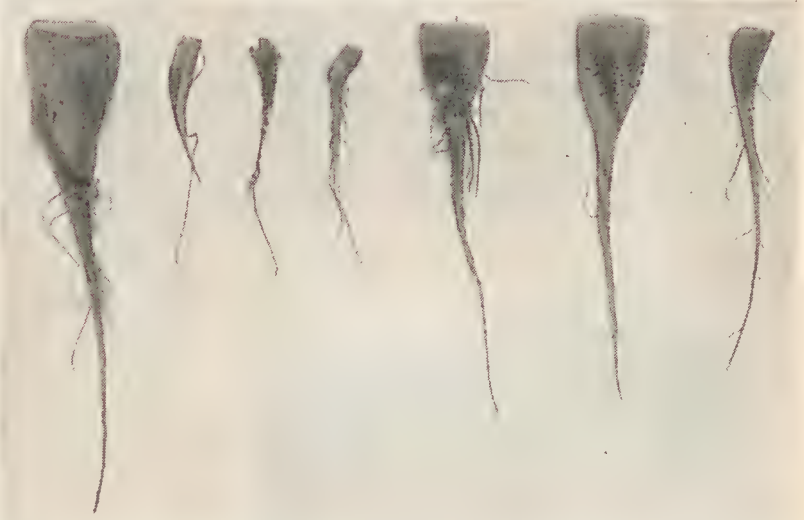


Fig. 18—Roots of beet plants grown in sand culture trials. Treatments, from left to right—complete solution, and deficiences of nitrogen, phosphorus, potassium magnesium, calcium, and boron respectively.

the plants began to die (Fig. 20), while the remaining leaves, in most instances, showed a marginal yellowing (chlorosis) extending between the veins. At the end of the experiment, the plants were prostrate and ill-developed, with very small roots (Fig. 18). The sugar content of the roots was 1.9 per cent. compared with 14.0 per cent. in the controls.

Early dying of the basal leaves of the beet plant is a very common occurrence in the Maffra district, particularly after continuous cropping with beet. While this early death is often associated with the leaf spot disease caused by *Cercospora beticola,* in other instances it is unassociated with this fungus. The efficacy of applications of potash in preventing this early dying of the basal leaves of beet under field conditions has yet to be determined.

Magnesium Deficiency.

Under conditions of magnesium deficiency, the plants grew normally for approximately eight weeks, after which time the first signs of a yellowing of the areas between the veins appeared on the older leaves. Later this chlorosis spread until the whole area between the veins was affected and the leaves finally died (Fig. 21). Although the roots of the plants were reduced in size (Fig. 18), magnesium deficiency had no effect on their sugar content.

Magnesium sulphate (Epsom salts) has been applied at the rate of 30 lb. per acre in conjunction with superphosphate to sugar beet in the Maffra area (Table I.). During the middle part of the season, the plots so treated were superior in appearance to the controls, but the yield of beet resulting was not significantly

Fig. 19.—Applying superphosphate with a grain drill to limed ground before sowing sugar beet seed.

Fig. 20.—Potassium deficiency symptoms in sugar beet. Note death of older leaves and rosetted appearance of inner leaves.

increased. This reversal of the mid-season indication regarding the superiority of this treatment may be related to the fact that, towards the end of the season, many of the plants developed symptoms characteristic of calcium deficiency described above. It would appear, therefore, that under field conditions, the calcium nutrition of the plant has an important effect upon the response of the plant to applications of magnesium.

ROTATION TRIAL.

It is the practice of many growers to sow the same area to beet for two or three consecutive years. As a consequence, the yield obtained in each succeeding year usually declines rapidly, and the area is finally rendered unsuitable for growing a good crop of beet for several years.

Observations have indicated that several factors combine to produce this "beet sickness." The leaf spot fungus, *Cercospora beticola,* has been found to be more prevalent in second and third successive crops, as this organism is enabled to accumulate in the soil as a result of continuous cropping.

Other factors, however, evidently play an important role in the production of "beet sickness," as beets growing on "beet sick" land often manifest many severe symptoms, such as early dying of basal leaves, rosetted appearance, and leaf scorch, which are suggestive of nutritional deficiencies. The beet plant is a gross feeder, and under a system of continuous cropping apparently rapidly depletes the soil of nutrients which are available to it.

The rotation experiment conducted at Maffra was designed to determine the relative effect of certain rotations, including crops such as maize, peas, and oats in promoting the growth

Fig. 21.—Sugar beet leaf showing marginal necrosis due to magnesium deficiency.

of a subsequent beet crop under both irrigated and dry conditions. It was also planned in the third year of the experiment to study the efficacy of mineral treatment in preventing the occurrence of "beet sickness." Unfortunately, severe drought conditions were experienced in that year, and the beet crop was a failure.

The individual plots in this experiment were 0.135 acre in area, and each treatment in both the irrigated and dry sections was replicated three times, making 33 plots in all. In the year immediately preceding the establishment of the experiment, the whole of the area occupied by the rotation experiment was sown to sugar beet. The treatments given in the first three seasons were as follow:—

Rotation No.	1936–37.	1937–38.	1938–39.
	Irrigated Section.		
1	Sugar Beet	Sugar Beet	Sugar Beet
2	Oats	Sugar Beet	Sugar Beet
3	Peas	Sugar Beet	Sugar Beet
4	Maize	Oats	Sugar Beet
5	Pasture	Pasture	Sugar Beet
6	Pasture	Pasture	Sugar Beet
	Dry Section.		
1	Sugar Beet	Sugar Beet	Sugar Beet
2	Oats	Sugar Beet	Sugar Beet
3	Peas	Sugar Beet	Sugar Beet
4	Oats	Fallow	Sugar Beet
5	Maize	Oats	Sugar Beet
6	Pasture	Pasture	Sugar Beet

The composition of the pastures sown in each section was as follows:—*Irrigated section*—Italian rye-grass, 5 lb.; Perennial rye-grass, 10 lb.; New Zealand red clover, 3 lb.; and White clover (irrigation strain), 4 lb. per acre. *Dry section*—Italian rye-grass, 5 lb.; Perennial rye-grass, 10 lb.; and New Zealand red clover, 8 lb. The pasture seed was mixed with superphosphate and sown through a grain drill.

As indicated above, each individual plot in both sections of this experiment was halved at the beginning of the 1938-39 season, and one-half was treated with superphosphate alone at the rate of 1 cwt. per acre, and the other half with the following:—Superphosphate, 1 cwt.; lime, 8 cwt.; copper sulphate, 5 lb.; zinc sulphate, 10 lb.; borax, 15 lb.; magnesium sulphate, 20 lb.; and potassium permanganate, 20 lb. per acre. This mixture of minerals, with the exception of the lime, was applied across the length of the plots by means of a grain drill. The lime was applied with a pasture topdresser (Fig. 13). All plots received an additional dressing of ½ cwt. of superphosphate per acre sown with the beet seed.

The yields of beet and sugar per acre resulting from the different treatments are shown in Table II.

To obtain the sugar percentage, six separate representative samples were obtained from each plot, and sugar determinations were made on each.

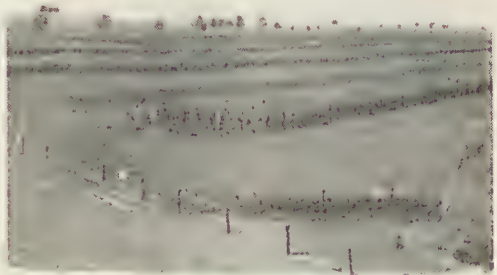


Fig. 22.—General view of portion of the rotation trial at Maffra.

In the first season, the yields of beet and sugar were very poor. Leaf spot disease and leaf scorch were prevalent. The latter disease was most in evidence on the dry section. Root aphis also occurred freely on the beets in that year, but appeared to be more abundant on the irrigated area.

The yields from the irrigated section were significantly higher than those obtained from the dry section.

The following season was more favorable to the growth of the beet, and higher yields resulted. These were again significantly higher on the irrigated section.

It will be seen from Table II. that the yields of beet after oats were significantly greater than those of beet after peas in the dry section, and the increase on the irrigated section approached significance. Throughout the season, the beet grown after oats was much superior in appearance to the other treatment, indicating the suitability of oats for rotation with beet. At the beginning of the 1938-39 season also, the germination and early growth of the beet on rotations No. 4 in the irrigated section and No. 5 in the dry section, which immediately followed oats, was very much better than any other treatment, including beet after fallow or pasture.

Leaf spot disease was not prevalent in the 1937-38 season, but leaf scorch and early death of basal leaves occurred freely in the "beet continuously" treatments. It is planned to continue this experiment for a further period of three years.

DUSTING EXPERIMENTS.

In overseas countries, the efficacy of spraying with Bordeaux mixture, or dusting with a copper-lime dust, to *prevent* the development of leaf spot caused by *Cercospora beticola* has been demonstrated. Usually several applications of the fungicide are necessary, and the cost of the treatment, in seasons or localities where the disease is prevalent, is generally more than offset by increased yields of beet and sugar per acre. While it is usually not so effective in controlling the disease, dusting is preferred to spraying, owing to the greater ease of application (Fig. 23).

In view of these results, experiments have been conducted to determine whether the control of leaf spot disease by dusting is an economic practice under Victorian conditions. The fungicide used was a copper-lime dust, consisting of 20 per cent. mono-hydrated copper sulphate and 80 per cent. hydrated lime. Three treatments at the rate of approximately 35 lb. of dust per acre were given during each season, at the following times:—Mid-December, mid-January, and early February.

TABLE II.—RESULTS OF SUGAR BEET ROTATION EXPERIMENT, MAFFRA, FOR THE SEASONS 1936-37 AND 1937-38, SHOWING THE EFFECTS OF ROTATIONS AND IRRIGATION ON THE YIELD OF BEET AND SUGAR.

Details of Rotation.	1936–37.			1937–38.		
	Beet Yield.	Sugar.	Sugar Yield.	Beet Yield.	Sugar.	Sugar Yield.
	Tons/ac.	%	Tons/ac.	Tons/ac.	%	Tons/ac.
Irrigated Section.						
No. 1.—1936–37—Beet ..	8·04	15·7	1·27	..	..	..
1937–38—Beet ..	..	..	..	13·43	14·3	1·924
No. 2.—1936–37—Oats ..	..	..	..	..	..	..
1937–38—Beet ..	..	..	..	17·80	14·2	2·529
No. 3.—1936–37—Peas ..	..	..	..	..	..	..
1937–38—Beet ..	..	..	..	16·76	14·1	2·371
Difference for Significance	..	..	..	1·43	..	0·174
Dry Section.						
No. 1.—1936–37—Beet ..	4·36	14·7	0·65	..	..	..
1937–38—Beet ..	..	..	..	10·91	14·7	1·595
No. 2.—1936–37—Oats ..	..	..	..	..	..	..
1937–38—Beet ..	..	..	..	14·04	14·8	2·081
No. 3.—1936–37—Peas ..	..	..	..	..	..	..
1937–38—Beet ..	..	..	..	11.60	14.2	1·644
Difference for Significance	..	..	..	1·58	..	0·28

Fig. 23.—Applying a copper-lime dust to sugar beet at Maffra.

The first experiment was conducted in the 1935-36 season on an area, half of which had grown oats in the previous season, and the other half beet. The results obtained in each section are shown in Table III. The plots were 0.03 acre in area, and each treatment was replicated three times.

In the subsequent experiments, each plot was 0.12 acre in area, and the treatments were each replicated three times. Four separate samples were obtained from each plot for sugar analysis. The results are set out in Table III.

As the yields in Table III. indicate, a very big difference in yield between sections (*a*) and (*b*) of Experiment No. 1 occurred. This was due to the rotational treatment, and was confirmed by the results of the rotation experiment described above (Table II). The very poor yields which were obtained in 1936-37 (Table III.) reflect the unfavorable seasonal conditions experienced.

In Experiment No. 1, the dusting treatment lowered the incidence of leaf spot, but little difference was noted in subsequent experiments, owing, in some cases, to the general poor growth of the plants, or to the fact that the disease was not prevalent on the untreated plants. In spite of this, it is seen from Table III. that in Experiments Nos. 1 (*a*) and 3, where the yields of the undusted plots were high, dusting produced a significant increase in yield.

Table III.—Results of Dusting Experiments with Sugar Beet at Maffra, During the Seasons 1935-36 to 1937-38, inclusive.

Treatment.	Beet Yield.	Sugar.	Sugar Yield.
	Tons/ac.	%	Tons/ac.
Experiment No. 1—1935-36.			
(a) Rotated Area (Beet after Oats).			
Dusted	15·72	17·1	2·68
Undusted	11·77	17·2	2·03
Difference for Significance ..	1·82	..	0·62
(b) Non-Rotated Area (Beet after Beet).			
Dusted	7·45	17·2	1·28
Undusted	6·71	16·8	1·11
Experiment No. 2.—1936-37.			
Dusted	4·71	16·6	0·77
Undusted	4·77	16·0	0·77
Experiment No. 3.—1937-38.			
Dusted	11·15	15·1	1·690
Undusted	10·38	14·7	1·521
Difference for Significance ..	0·366	..	0·115

It may be seen, therefore, that the practice of dusting the sugar beet crop in the Maffra district may be expected to result in increased yields in some seasons. Further experiments will be necessary, however, before this practice can be recommended.

SEED TREATMENT.

Experiments have been conducted to determine the efficacy of certain seed treatments in controlling the development of black leg in sugar beet. It is stated earlier in this report that this disease may be associated with the occurrence of the fungus *Phoma betae* in the blackened tissues of the plant. While this fungus has been frequently isolated from sugar beet seed cultured at the Plant Research Laboratory, Burnley, however, field observations have indicated that it may be of secondary importance only in the causation of the disease. It was necessary, however, that the effect of seed treatment be studied.

The treatments applied were as follows:—

Untreated.

Decortication (treated with sulphuric acid).

Mercury compound G 0.25 per cent. solution. Seed treated for one hour.

Copper carbonate 1½ oz./bushel.

Mercury compound C 1½ oz./bushel.

The individual plots in these eexperiments were 0.0218 acre in area, and each treatment was replicated three times.

The cultivation and other treatments given to the area before sowing were in accordance with good cultural practice designed to render conditions as favorable as possible for the rapid early development of the beet. In the case of each experiment the site in the previous year was sown to oats.

In each season the decorticated seed was slightly in advance of the other treatments in germination, while mercury compound G slightly retarded early growth. The incidence of black leg in any of the plots was very small, and no differences between treatments were observed. The yields obtained from these experiments are shown in Table IV.

Fig. 24.—Sowing the beet seed.

TABLE IV.—RESULTS OF SUGAR BEET SEED TREATMENT TESTS—MAFFRA, 1936-38.

Treatment.	Beet Yield.	Sugar.	Sugar Yield.
	Tons/ac.	%	Tons/ac.
EXPERIMENT No. 1—1936-37.			
Untreated	13·15	15·1	1·99
Mercury compound "G"	12·18	15·2	1·83
Decorticated	11·76	15·8	1·87
Copper carbonate ..	11·49	14·9	1·72
Mercury compound "C"	10·89	15·6	1·70
Difference for Significance ..	1·40	..	0·19
EXPERIMENT No. 2—1937-38.			
Untreated	16·41	13·8	2·267
Mercury compound "G"	16·41	13·2	2·161
Decorticated	15·48	13·9	2·146
Copper carbonate ..	17·04	13·7	2·340
Mercury compound "C"..	17·02	13·6	2·327
Difference for Significance ..	1·31	..	..

To estimate the sugar yield per acre, three samples were obtained from each individual plot and separate sugar analysis were performed on each.

In experiment No. 1, treatment with mercury compound C and copper carbonate resulted in a significant reduction in yield, but in the next season no treatment had any significant effect on either the beet or sugar yield.

From these results, it is evident that under conditions at Maffra, where proper precautions are taken to provide favorable conditions for germination, no beneficial effect may be expected from seed treatment.

Pig Housing and Equipment

(*Continued from page* 13).

pigs within certain weight ranges. It is difficult for growers to accurately estimate the weight of their pigs which they have seen every day from birth, and an occasional weighing during the finishing stages of the pigs' growth would help farmers to market them at the desired weights and so get their full value. Further, by weighing foods given to pigs the grower can keep a check on his production costs and on the food consumption for each pound of live weight gain.

To weigh pigs up to baconer weight a crate 4 feet long, 18 inches wide, and 2 ft. 6 in. high should be provided with sliding doors at both ends. Wires should be fixed around the crate and brought together from the four corners to a ring over the centre of the crate. A simple lever arranged by a pole fixed to an overhead beam can be used to hold the scale hooked on to the wire of the crate. The weighing crate should be fixed in a race as shown in Fig. 6.

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—February, 1940.

The Cattle Breeding Act

Now in Operation

PROCLAIMED on 11th January, 1940, the Cattle Breeding Act passed in 1938 is now in operation. The Act has as its objective the improvement of the beef and dairy qualities of the cattle in Victoria. The following summary of the provisions of this legislation is published for the guidance of dairy farmers and breeders.

A desirable type of dairy bull whose dam produced 565 lb. butter-fat.

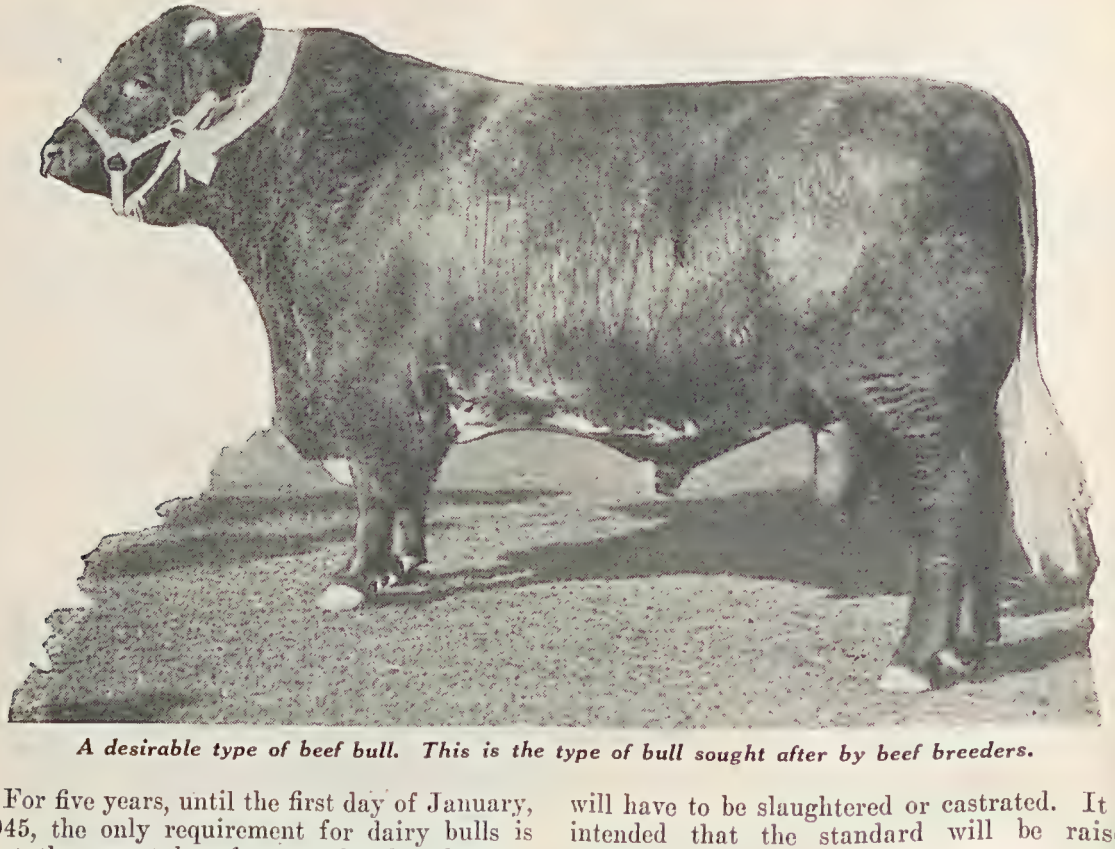
The Act provides that if any bull does not conform to a reasonable standard in respect to type, conformation, and breeding, and does not show manifest evidence of the breed characteristics of one of the recognized breeds of cattle appropriate to dairying or beef production (as the case may be), the Chief Veterinary Inspector may require the bull to be castrated or slaughtered within a period of three months of notice being given in writing.

The Act also provides for the improvement of milk and butter-fat production in that *after the first day of January,* 1945, the Chief Veterinary Inspector may require any bull over two years old which is kept on a dairy farm and which is the progeny of a cow which has not produced in any one lactation period of 273 days and under a recognized herd-testing scheme, such amount of butter-fat as is prescribed, to be castrated or slaughtered within three months.

Owners of bulls have the right to appeal within 30 days against notices for the castration or slaughter of their bulls. A member of a panel of referees, appointed by the Minister of Agriculture, will determine the appeal.

No compensation will be paid for bulls which have to be castrated or slaughtered under the provisions of this Act, and the Act provides that persons who do not carry out the instructions of the Chief Veterinary Inspector or who hinder inspectors from examining bulls are liable to fines of up to £50.

It is the duty of stock inspectors and dairy supervisors to report to the Chief Veterinary Inspector any bull which does not measure up to the required standards.



A desirable type of beef bull. This is the type of bull sought after by beef breeders.

For five years, until the first day of January, 1945, the only requirement for dairy bulls is that they must be of reasonable breed, type, and conformation, but breeders of stud dairy stock and dairy farmers generally are advised to prepare for the coming into force of the secondary stage of the Act in 1945 by selecting bulls the dams of which have been proved to have reached a satisfactory standard of butter-fat production.

Breeders are advised to test their cows either in the Standard Herd Test conducted by the Department of Agriculture or with the Victorian United Cow Testing Association, so that by 1945 they will be in a position to sell their bulls to dairy farmers.

During the first year, the standards adopted for type conformation and breeding will be relatively low, and only the obvious "scrubber" will have to be slaughtered or castrated. It is intended that the standard will be raised gradually.

The standard of butter-fat production of the dam adopted in 1945 will be low enough to ensure a sufficient number of bulls to meet requirements, and this standard also will be raised from time to time as larger numbers of higher producing cows come into being.

To the beef breeder, the Act should present no difficulties, partly because beef men generally exercise more judgment in the selection of their herd sires, and partly because such visible characters as type, conformation, and breeding do indicate, to a large extent at any rate, the breeding ability of the bull.

Copies of the *Cattle Breeding Act* 1938 are obtainable from the Government Printer, Melbourne, C.2—price 6d.

Book Review

Vacuum Guide for the Man on the Land

A new publication entitled *Vacuum Guide for the Man on the Land* has just been issued by the Vacuum Oil Co. Pty. Ltd. It contains several articles of interest to the practical farmer and may be regarded as a compendium of useful information. Copies of this work may be obtained on application to the nearest branch of the Vacuum Oil Company.

Wheat Crop Championships

Wimmera and Mallee Results

WHEAT crop championship competitions, for the Wimmera and Mallee, were held last season by the Farm Competitions Association in conjunction with the Royal Agricultural Society. The latter body donated to both sections, a prize of £40 for the grower of the champion crop and £10 for the district agricultural society which nominated the winning exhibit.

The Wimmera championship was judged by Mr. W. B. Miller, M.Agr.Sc., Senior Inspector of Agriculture, while that for the Mallee was judged by Mr. H. L. Hore, B.Agr.Sc., Inspector of Agriculture. The results, together with the judges' comments, are set out below.

The champion crop of the Wimmera for 1939, which was grown by Mr. L. H. Clark, Nhill.

Wimmera.

Eleven agricultural societies, representing almost every Wimmera district, nominated the best 50 acres of wheat crop exhibited in each of their local competitions in the contest for the 1939 Champion Wheat Crop of the Wimmera.

The competition created great interest throughout the Wimmera, and stimulated the crop competition movement which is recognized as one of the principal means by which improved production methods might be encouraged and disseminated.

Whether wheat is grown in time of peace or war, under conditions of limited production, or in periods of scarcity, the fact remains that it should be produced as economically as possible. Improved cultivation practices, machinery, varieties, and disease control methods all contribute to the ever changing scene of continuous progress in production which is revealed and extended in the surveys and contacts made through the medium of crop competitions.

The championship was won by Mr. L. H. Clark, of Nhill, with a very heavy, even, and clean crop of the Ghurka variety which yielded 49.3 bushels per acre from 52 acres of heavy black ground at Kinimakatka. The grain was very well filled, and weighed 66 lb. per bushel. The crop was harvested in the presence of Mr. A. B. Hackwell, B.Agr.Sc., Agricultural Instructor, who judged the local competition at Nhill, and, in accordance with the rules, certified to the area and yield.

The Ghurka crop grown at Swanwater West by Mr. H. E. Bath, of Donald, was placed second, and yielded approximately 45 bushels per acre. It was remarkably even and outstanding as regards purity of seed, and absence of weeds and preventable diseases. A little rust was present, but the grain weighed heavily.

The Rupanyup entry, that of Mr. H. Fraser, was also a very heavy Ghurka crop, which might easily have won the competition but for the effects of rust which reduced the size of the

Harvesting the Rupanyup entry in the championship.

grain. Despite the rust, it yielded approximately 45 bushels per acre, but was placed third as the seed was not quite as pure as that of the Donald crop.

Mr. J. O'Connor, winner of the Charlton competition, exhibited 50 acres of Ghurka, much of which was as heavy as any inspected by the judge, but some lighter crop on the rising land reduced the average to approximately 42 bushels per acre.

Somewhat similar circumstances of uneven land militated against the Kaniva entry of Mr. G. Rich, which was almost as heavy as the Charlton crop.

The crops of Dundee, shown by Mr. A. Kerr, of Thalia, near Wycheproof, and of Ghurka, by Mr. J. J. McIntyre, of Murtoa, were also fine exhibits, while the nominations from Jeparit (E. G. Nuske), Dimboola (H. E. Holland), Warracknabeal (L. Landt), and Minyip (M. Landwehr) were creditable considering the adverse conditions experienced in these latter districts during the early spring months.

Mallee.

Six Mallee agricultural societies competed in the contest for the 1939 Champion Wheat Crop of the Mallee. The districts represented were Beulah, Hopetoun, Kerang, Ultima, Walpeup, and Werrimull, and the best 50 acres of wheat crop grown on ordinary fallow and exhibited in each of the local competitions conducted in these districts competed for the championship, which was conducted for the first time this year.

The season in most parts of the Mallee was satisfactory, although in a few districts there was not sufficient rain to meet the needs of the growing crop, and in some cases crops which promised high yields were severely damaged by frost.

The championship was won by Mr. S. G. Mahar, of Kerang, with a crop of Ghurka variety, the yield of which was assessed at the very high figure for a Mallee crop of 36 bushels per acre. The grain was a good sample with a weight direct from the harvester of 66 lb. per bushel.

Second place was secured by Mr. A. C. R. Shannon, of Beulah, who showed a crop of Bencubbin wheat, the yield of which was assessed at 31 bushels per acre.

To certify to the area and yield, an officer of the Department of Agriculture was present at harvest time to see each of these crops stripped.

The other entries, all of which were inspected by Mr. Hore, were a credit to their exhibitors, and the ability of Mallee areas to produce good wheat crops under suitable conditions is

[*Continued on page* 59.

Farm Improvement Competition

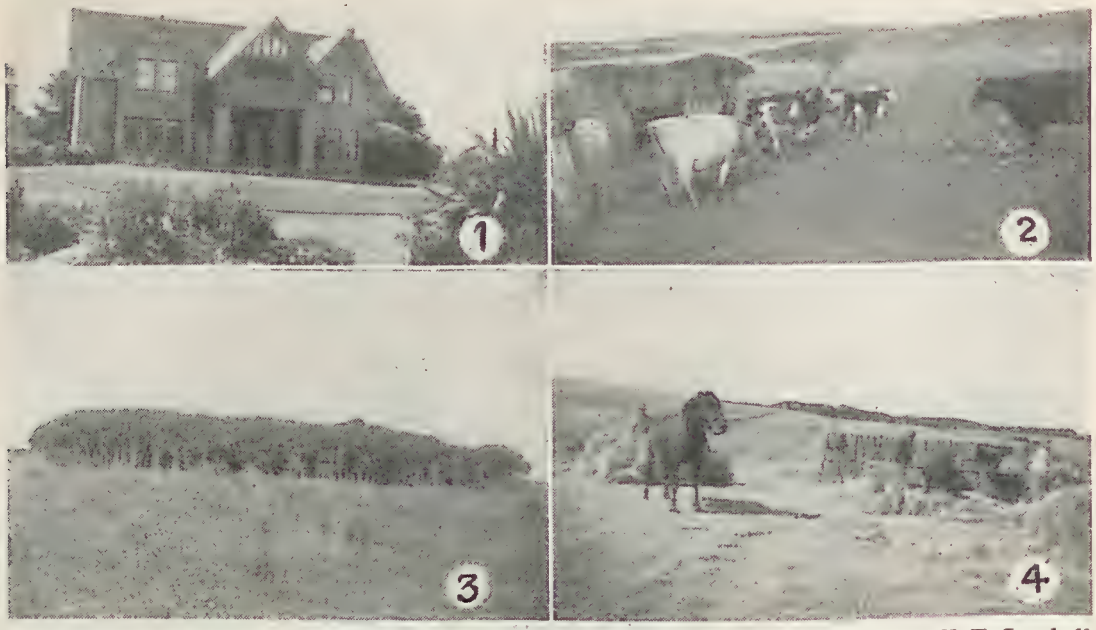
Results at Phillip Island

Report of the Judges Messrs. L. C. Bartels, Senior Agrostologist and D. R. McKenzie, Senior Dairy Supervisor.

Cutting oats on the property of Mr. L. R. Dixon, Phillip Island.
[Leader photo.

THE Phillip Island Better Farming League inaugurated its Farm Improvement Competition in 1933. The main object was to improve the pastures and livestock on the island and to increase production. The competition is based on improvements extending over a period of twelve months ending in November each year and therefore has the effect of stimulating effort where greatest improvement is possible. Although pastures and stock are the principal sections of the competition, points are awarded also for fodder and crops, improvements in clearing, fencing, plantations, drainage, water supply, building renovations and machinery. That such a competition has been of benefit to the island is indicated by the high standard of the entries for 1939.

A dense growth of meadow hay on the property of Mr. W. B. Dixon.



The winner of this year's Phillip Island Farm Improvement competition was Mr. A. K. T. Sambell. Some views of his property are shown above. 1. The homestead. 2. Some of the young stock. 3. An effective shelter belt of tea-tree. 4. Sweeping and pressing grass hay.

Pastures.

The improved pastures on the island are mainly combinations of perennial rye-grass and subterranean clover. In some, cocksfoot is an important constituent, in others, paspalum was showing, and these two latter elements would be valuable supplements to the rye-grass and clover. Kentucky blue grass was prominent in some of the pastures, and *Phalaris tuberosa* had been introduced by a few farmers.

All the natural trefoils were plentiful—mainly cluster clover, woolly clover, suckling clover and nodding clover—while fenugreek (*Trigonella ornithopodoides*) was in evidence on practically all farms. Some of the more ambitious farmers had sown white clover and strawberry clover, and the results indicate that there is a place on the island for these two valuable pasture elements.

Some of the best pastures had developed from meagre growths, the results of earlier efforts at establishment some 20 years ago, as a result of topdressing, and in these the rye-grass particularly was of excellent type—the present swards represent the survival of the hardier types. Most farmers in laying down pastures in recent years had been careful to sow good strains of perennial rye-grass, mainly certified Victorian seed—some used certified Hawke's Bay seed. One or two paddocks of pasture, however, were obviously sown with false perennial rye-grass, and inquiries elicited the information that it had been purchased on the assurance that it was just as good as certified seed and much cheaper.

The importance of sowing only the best seed in laying down new pastures is again emphasized. Seed certification schemes are designed to preserve the identity of the good strains of seed in trade channels, and in Victoria certification is applied to seed only of superior strain. Tests conducted by the Department of Agriculture have demonstrated the value of Victorian rye-grass and cocksfoot, and these should be sown when available. If costs are high it is better to reduce the rate of sowing than to compromise on this matter. If white clover is to be sown, certified New Zealand white clover is recommended.

Undoubtedly the biggest single factor in the development of the wonderful pastures which are features of the farms on the island has been the extension of the practice of topdressing with superphosphate, and the different stages

of progress are closely related to the amount and frequency with which the super. has been applied. In general, the rate of application is about 1 cwt. per acre, several farmers use a bag per acre, and the benefits of even more liberal applications in a few instances were apparent in the obvious quality and vigour of the herbage.

In 1938 the dry season limited growth, but the efficacy of topdressing was not in doubt and even in 1939, when there was such a plenitude of feed, the top-dressed paddocks were easily distinguished in varying degrees of excellence. The pastures of the island last year were very clean—manuring which has encouraged the better elements leads to the suppression of weeds and this applies particularly to "blue weed" (*Centaurea australis*), and to sorrell also.

"Bidi Bidi" is a troublesome weed in parts, and, although there is some doubt about it, topdressing and heavy stocking seem to lead to its elimination. Mr. Morgan-Payler maintains that it must be chopped out or cultivated out. On many blocks of the island there are salt flats.—Evidence was forthcoming that these may be effectively reclaimed by topdressing.—Mr. Trew applied stable manure to a section of such land on his block and had established rye-grass and clover on this treated area. Mr. McLardy drew attention to the same thing. "See how the white pan is covering up as a result of topdressing".

A few farmers grow supplementary fodder crops, and at inspection time oat crops were exhibited and areas were in preparation for sowing rape and mangels, millet, maize, sorghums, etc. Most farmers aim at laying down the entire farm to grass, and no farmer was disposed to break up good pasture for cropping.

The value of adequate subdivision is recognized and in general this has been carried out. Knowing the importance of regulated grazing, small paddocks to permit the movement of stock was the objective. Mr. Morgan-Payler, who had 1,200 ewes and lambs, said that 30 paddocks to permit daily changes would be ideal. In passing, it may be observed that subdivision by electric fences has been adopted by many farmers, and this year when waste would be inevitable it has proved very satisfactory.

Harrowing of pastures is practised but is not general. Some of the more advanced farmers clip the grass occasionally to get rid of rubbish and to promote fresh growth. Hand

Excavating a silage pit on the property of Mr. A. K. T. Sambell.

Raking meadow hay from swathe to windrow.

feeding during the drought had absorbed practically all fodder reserves, but most farmers were preparing to save some of this season's superabundant feed as meadow hay. This is the usual method of conservation on the island. Ensilage is not practised to any great extent, although it has proved quite successful.

One result of the dry spell was the revelation that underground water is available on most farms of the island. Many wells were sunk and springs opened when the dams emptied. In some cases the water is mineralized but potable, and the farmers now have much greater security than before.

At inspection time, prepartions were being made by most farmers in the competition to conserve some of the surplus grass available, as meadow hay. They know that if best results are to be obtained from pastures, and livestock are to be carried with a reasonable degree of security, attention must be directed to the important work of fodder conservation, and, of course, this lesson was emphasized in the 1938-39 season.

Many of the competitors presented beautiful meadows for inspection, and it was difficult to appraise their comparative worth. Crops expected to yield up to 3 tons of hay per acre were common, and the points allotted under the heading "Fodder and Crops" are an indication of their general excellence.

Mid-seasonal subterranean clover is the strain commonly sown on the island, but it is interesting to observe that Tallarook, a late strain, made an excellent showing this season. Portion of Mr. L. R. Dixon's pasture had this strain as a main component, and the exuberant growth of his meadows was noteworthy. Mr. Dixon manures liberally. He has applied a bag of super. per acre for successive years, and of

A simple device attached to divider of mower which facilitates mowing of dense subterranean clover.

course the seasonal conditions permitted full expression of the soil improvement which he has effected.

It may be stated in passing, that a regional strain of subterranean clover which has developed naturally on the island is a late maturing type.

Not much silage is made on the island, although, as stated above, stack ensilage has been proved to be quite practicable and successful. Mr. Sambell excavated two pits recently, and with the aid of sweep rakes filled them expeditiously. It is safe to say that this enterprise will be successful and ensilage of some of the spring flush of feed will become routine practice.

Stock.

Many of the herds and flocks are showing signs of careful management, and there is ample evidence, from the docility of the animals, that they are treated with every consideration. Apart from this aspect, the quality of the stock is showing steady improvement. Pedigree bulls and rams are being used, and herd testing is being practised. Only the better quality heifers and ewe lambs are carried forward for replacements. New sires have been introduced into the herds of Messrs. A. K .T. Sambell, H. Justice (Dairy Shorthorn) and L. R. Dixon (Jersey), while in the female section seven of the competitors scored points.

Most of the competitors scored well in the sections for young stock. A marked advance is also being effected in the quality of pigs. This has been brought about by the use of pure-bred boars, and in some instances pure-bred sows.

Other Improvements.

Owing to the wet winter little progress was made with new plantations during the year. Mr. Parry planted 7 chains of cypress, Mr. Mallory 12 chains of beach tea-tree, Mr. Gliddon 3 chains of gums while Mr. R. G. Jeffery replanted about 2½ acres, the trees on which had died during the heat last summer.

Much clearing had been done during the year; 30 acres by Mr. R. G. Jeffery, 18 acres by Mr. Morgan-Payler, 14 acres by Mr. W. B. Dixon, 10 acres by Mr. Sambell, and 9 acres by Mr. John Graydon.

New fences have been erected, existing fences repaired, and new sub-divisions have received attention. Sixty chains of new fences were inspected on Mr. Morgan-Payler's farm; 28 chains were repaired at Mr. John Graydon's, 7 chains at Mr. Parry's and 3 chains at Mr. Trew's. Three of the competitors, Messrs. J. B. Graydon, H. Justice and A. K. T. Sambell, have electric fences. Electric fencing opens up a new possibility for smaller and more economic sub-division. Cheapness and saving in time are its two greatest advantages. The electric fence will hold stock as well as the best seven-wire fence. The wire

A heavy stocking of cross-bred ewes and lambs on Mr. F. Morgan-Payler's property.

Electric fencing and water supply on Mr. H. Justice's farm. Note that a single wire only, separates the grazed and ungrazed pastures.

used is barbed, placed on posts 12 or 14 yards apart (with insulators) about 3 feet from the ground. The power is supplied by a 6-volt battery, wet or dry. Using an ordinary car accumulator, the annual cost of the power is said not to exceed 10s.

Water supply again has received attention. Wells have been sunk my Messrs. J. Roberts, J. W. Gliddon, N. McLardy and A. R. Jeffery, while dams are being enlarged on the farms of Messrs. R. G. Jeffery, P. G. Trew, J. W. Gliddon and J. B. Graydon.

Several additions to buildings have been made. A new cowshed, separator, engine and boiler rooms have been erected by Mr. W. B. Dixon, while an engine room, boiler room, and pig shelter houses have been built by Mr. V.

INCREASES IN POINTS AWARDED FOR THE TWELVE MONTHS ENDED NOVEMBER, 1939—PHILLIP ISLAND.

—	Pasture.	Fodder and Crops.	Male.	Female.	Young Stock.	Uniformity Health and Appearance	New Plantations.	Clearing.	Fencing.	Water Supply.	Buildings, Additions, and Renovations.	Machinery.	Total Points.
Sambell, A. K. T. ..	6	13	1	3	1	1	..	1	1	..	..	2	29
Dixon, L. R. ..	7	14	1	2	1	1	..	..	..	..	1	..	27
Dixon, W. B. ..	8	13	..	..	1	1	..	1	..	..	2	1	27
Morgan-Payler, F. ..	5	12	..	2	1	1	..	2	2	..	1	..	26
Mallory, W. A. ..	9	13	..	..	..	1	1	1	..	..	..	..	25
McLardy, N. ..	7	10	..	1	..	1	..	1	..	1	1	1	23
Trew, P. G. ..	6	12	..	1	..	1	..	..	1	1	1	..	23
Jeffery, R. G. ..	2	12	..	..	1	1	..	2	1	1	1	2	23
Graydon, John ..	5	10	..	1	..	..	..	1	1	..	1	1	20
Graydon, J. B. ..	2	12	..	..	1	..	..	..	1	1	1	1	19
Justice, H. ..	4	11	1	..	..	1	..	..	1	..	..	..	18
Justice, V. ..	..	11	..	..	..	1	..	..	1	..	2	1	16
Gliddon, J. W. ..	3	10	..	..	1	..	1	..	..	1	..	..	16
Jeffery, A. R. ..	8	..	..	..	..	..	..	1	..	1	1	1	12
West, A. E. ..	..	10	..	1	..	..	..	..	..	..	..	..	11
Roberts, J. ..	2	6	..	..	..	..	..	..	..	1	..	..	9
Parry, W. H. ..	2	..	..	..	..	..	2	..	1	..	..	..	5

Justice. Mr. J. B. Graydon has made additions to his cowshed, lined the dairy, and built an engine room. Mr. John Graydon has built a new cowshed and separator room. A new sheep dip and concrete sheep foot bath, as well as concrete footpaths were inspected at Mr. Morgan-Payler's. Mr. Trew has also put down concrete paths. Additions to homes of Messrs. L. R. Dixon, N. McLardy and A. R. Jeffery were inspected.

Mr. R. G. Jeffery has installed an electric plant to supply light to his home and has also purchased a new hay rake. Messrs. W. B. Dixon, J. B. Graydon, A. K. Sambell and V. Justice have installed milking machines, engines and boilers.

The Awards.

Mr. A. K. T. Sambell, who was second in 1938, secured first place with an aggregate of 29 points for improvements during the year. The work done was distributed over nine of the thirteen sections of the Competition. On this property, dairying is successfully carried on in conjunction with wool growing and fat lamb raising. Careful attention has been paid to the selection of the foundation of a Dairy Shorthorn Stud. The stock carried on this property consists of 700 breeding ewes, 400 lambs, 110 store sheep, 120 head of cattle, including 45 milking cows (10 head of Stud Dairy Shorthorn cows, and one pure bred bull had been purchased during the year). Thirty yearling heifers and 22 calves, showing good quality, were inspected.

Twenty acres have been cleared and electric sub-division fences have been erected, which are proving effective. Milking machines have been installed, together with a steam boiler to provide an abundance of hot water and steam for cleansing the dairy utensils. A new hay press has also been purchased. There is an ample water supply for stock, home, garden and buildings. By the aid of a windmill water is pumped to an overhead tank, whence it is reticulated to many points. A nice flower and vegetable garden with an unusual variety of trees and shrubs surrounds the two storied homestead.

The brothers Messrs. L. R. and W. B. Dixon, were equal for second place with a total of 27 points, the former being third last year. The improvements of each farmer cover seven sections. Both scored well in the sections for pasture, crop, fodders, stock and buildings.

Fourth place goes to a new entrant, Mr. Morgan-Payler. This competitor has done excellent work during the year, scoring 26 points with work covering nine of the sections.

Mr. W. H. Mallory (a former winner) with a score of 25 points, was again well in the picture, in fact, this farm is now so well improved that there is not the same scope to score many points. However, he gained highest points for his excellent pastures.

Two new entrants, Mr. P. G. Trew, 23 points, and Mr. John Graydon, 20 points, deserve credit for the all round improvements effected on their properties.

Wheat Crop Championships—*continued from page 52.*

indicated by the fact that the average estimated yield of all the crops entered for the competition was 28½ bushels per acre.

All exhibits were on soil typical of the Mallee.

The winning exhibit was produced on land which had grown oats in each of the three years prior to fallowing in 1938. It was mouldboard ploughed 3 inches deep in July, cultivated twice before harvest, again in March, and the crop was combined in early in May with 65 lb. of dry-pickled Ghurka seed and 80 lb. of superphosphate per acre.

Mr. Shannon's entry was ploughed out of grass in August, worked in October, and again three times after harvest before sowing early in May with 65 lb. of dry-pickled Ghurka seed and 80 lb. of superphosphate per acre.

Three of the competing entries were sown with Ghurka, two with Bencubbin, and one with Ranee 4H. Ghurka is the most widely-grown wheat, with Ranee 4H (including Ranee) next in popularity, both in Victoria as a whole and in the Mallee districts of Victoria. In recent years, Bencubbin has been introduced and, as its suitability for the lower rainfall areas of this State has now been established, an increase in the area sown to this variety in the Mallee districts is anticipated.

The district crop championship, by creating a healthy spirit of rivalry between competitors, can do much to stimulate the crop competition movement, and so lead to an improvement in the methods of economic production.

Harvesting Tomatoes

By B. P. Krone, Fruit Packing Instructor

Previous articles dealing with various phases of Tomato culture appeared in the February, April, June and July 1939 issues of this Journal.

IT can be readily understood that, if tomatoes were fully ripe when harvested, they would arrive at their destination in an overripe condition, but on the other hand the fruit should not be green, because immature fruit fails to develop good colour and flavour. The accepted description of maturity for harvesting purposes is as follows:—"Tomatoes should always show at least some colour; a definite tinge of pink should have developed at the flower end of the fruit. Tomatoes should never be harvested while totally green."

The stage of maturity must necessarily be modified and will vary slightly, according to distance from, and the nature of, the market for which the fruit is intended. These modifications are described in the section on grading: Such modifications are really a classification of the grades, but also an excellent guide for harvesting. The reference made in connexion with the San Mazano variety should be carefully noted because the somewhat dry and mealy nature of this fruit gives it wonderful transport qualities.

To maintain uniformity in the standard of maturity, or degree of colour, tomatoes should be gathered regularly and at frequent intervals in order that the quantity of overripe fruit may be kept at a minimum. This is known in the tomato industry as "close" picking.

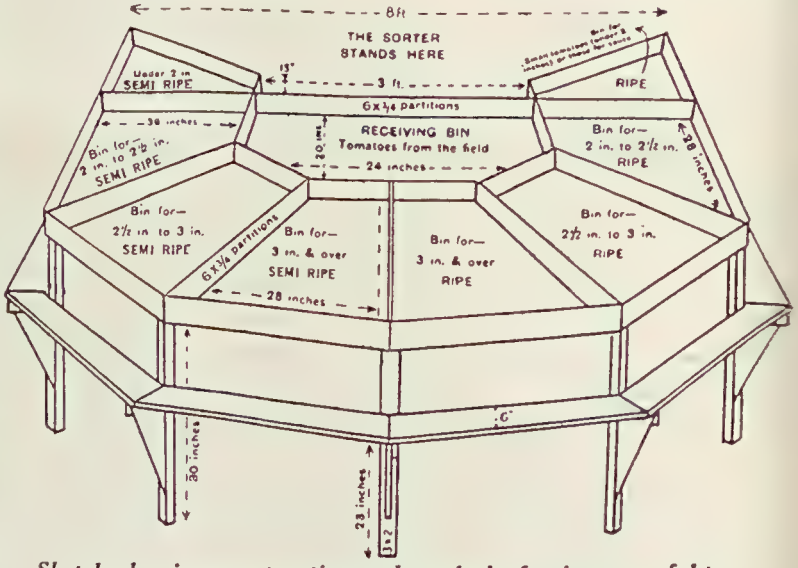
Early in the season there is sometimes a temptation to pick the fruit too green. The quantities of green tomatoes on the market are responsible, to some extent, for comparatively poor returns to growers, and, except for small quantities for pickling purposes, they are not desired by the public.

On arrival at the market, grean tomatoes have to be kept until sufficient colour develops in them before they can be sold. This is a matter of some days, and even then, although they may develop some colour, if treated in a colouring chamber, they usually have an immature or stale appearance and must compete with fresh, ripe fruit, and the growers' returns suffer accordingly.

Sizing.

The size of a tomato is the greatest measurement of its diameter from cheek to cheek; not from stem to eye. For example, if the various sizes are to be graduated in variations of quarter of an inch, the 2¼-in. size would mean any tomato having a minimum diameter of 2¼ inches, but would include other tomatoes larger than this, but not 2½ inches, and so on for the other sizes.

Sizing means the sorting of the fruit into these or other ranges of sizes. The sizes prescribed in the regulations under the Fruit Act are as follow:—2 inches and under, 2 inches


8ft
THE SORTER STANDS HERE
Under 2 in. SEMI RIPE
3 ft.
RIPE
6 x ¼ partitions
RECEIVING BIN
Tomatoes from the field
Bin for— 2 in. to 2½ in. SEMI RIPE
Bin for— 2 in. to 2½ in. RIPE
24 inches
38 inches
Bin for— 2½ in. to 3 in. SEMI RIPE
6 x ¼ partitions
Bin for— 3 in. & over SEMI RIPE
Bin for— 3 in. & over RIPE
Bin for— 2½ in. to 3 in. RIPE
28 inches
30 inches
28 inches

Sketch showing construction and method of using a useful type of grading and packing bench for tomatoes.

to 3 inches, and 3 inches and over, but it is much better to maintain a standard higher than that required by the regulations. This can be easily accomplished by the beginner, if he graduates his fruit in groups of not more than ½ in. diameter differences, until he becomes experienced enough to size in quarter inches. It may be of interest to note that apples are sized by quarters, or even eighths of an inch, while citrus fruit is always sized in eighths of an inch. Therefore, to adopt the practice of sizing tomatoes in gradations of a quarter or even half an inch would be a move in a forward direction, and would make for much more attractive packing than is otherwise possible.

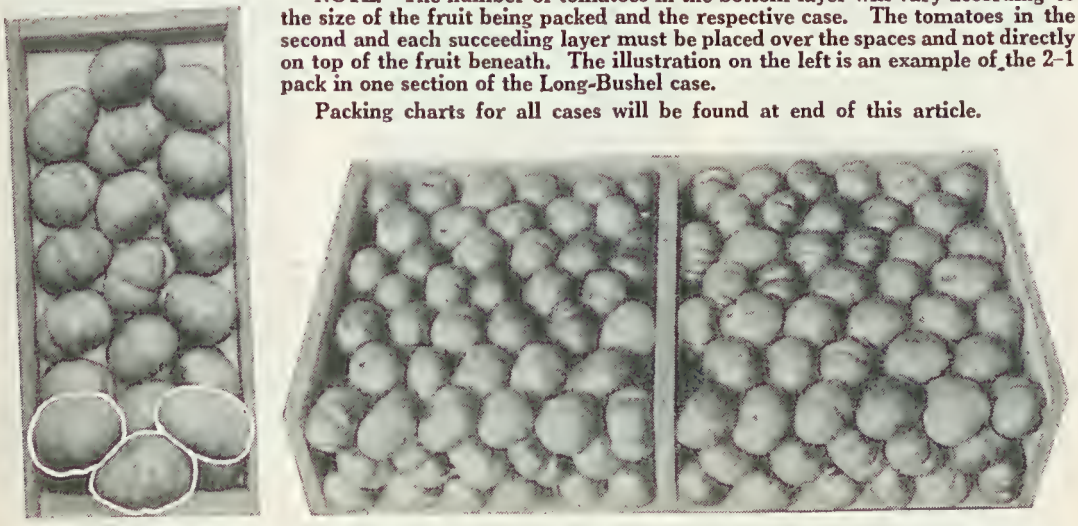
The grading and packing bench, illustrated on previous page, in use. Note the "nailing down" stands on which the packed cases are resting preparatory to the lidding operation.

Good packing of any fruit largely depends upon accurate sizing. If tomatoes are not reasonably uniform in size they will be difficult to pack attractively. The beginner, however, can soon acquaint himself with the sizes by the use of rings or a board in which holes are cut with which to measure the fruit; a method which has proved successful in the apple and pear industry. After a little practice, this style of gauge will be required only for checking purposes, because the packer will know at a glance the size of any fruit.

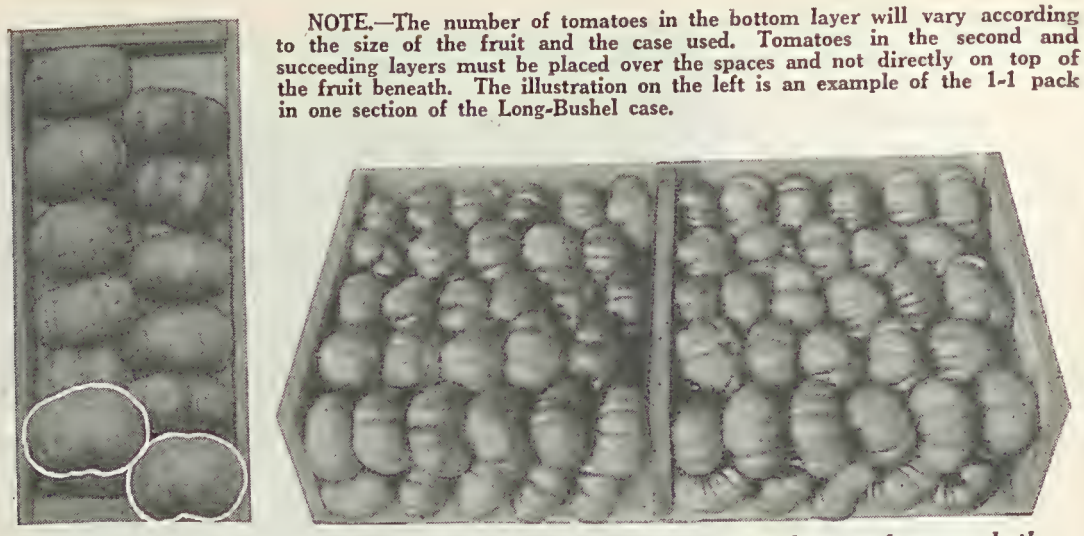
Successful marketing of the tomato is impossible without good sizing and grading. The day has passed when the simple operation of just harvesting the fruit and filling it into cases

NOTE.—The number of tomatoes in the bottom layer will vary according to the size of the fruit being packed and the respective case. The tomatoes in the second and each succeeding layer must be placed over the spaces and not directly on top of the fruit beneath. The illustration on the left is an example of the 2-1 pack in one section of the Long-Bushel case.

Packing charts for all cases will be found at end of this article.



The 2-1 pack. Showing the method of placing tomatoes in the bottom layer and the commencement of the second layer for the 2-1 packs which are described in the charts for the Long-Bushel, Half-Standard, and Half-Dump cases. On the right is shown a finished case of the 2-1 pack in the Long-Bushel case with the lid and side removed to show arrangement of the fruit.



NOTE.—The number of tomatoes in the bottom layer will vary according to the size of the fruit and the case used. Tomatoes in the second and succeeding layers must be placed over the spaces and not directly on top of the fruit beneath. The illustration on the left is an example of the 1-1 pack in one section of the Long-Bushel case.

The 1-1 pack. Showing the method of placing tomatoes in the bottom layer and the commencement of the second layer for the 1-1 packs which are described in the charts for the Long-Bushel and Half-Standard cases. On the right is shown a finished case of the 1-1 pack in the Long-Bushel case, with lid and side removed to show arrangement of the fruit.

was deemed sufficient. In the market of to-day, keen rivalry demands that the fruit must be sorted into sizes, graded according to quality, and packed on an approved up-to-date system.

The writer recognizes that extremely "close" methods of sizing and grading are not only tedious, but expensive if carried out on an ordinary single-bin bench. In fact, experiments show that accurate sizing, grading, and packing of tomatoes will not pay if attempted from such a bench. On the other hand, it has been proved that, when sizing, grading, and packing have been converted into separate operations by the adoption of a special but simple type of bench which is illustrated, not only is the work facilitated but also handling expenses are greatly reduced. Another illustration shows the same bench with the grader and packer at work.

This type of bench is used throughout the Portland district. One well-known grower there packed 100 cases in 6½ hours as a test. By way of comparison, it can be readily observed in districts, where suitable sizing benches are not used, that a family of two, or even three, work very hard to pack as many as 40 cases in a similar time.

Undoubtedly the type of equipment which is recommended very materially assists in the reduction of overhead costs and handling expenses, together with the easy maintenance of a standard grade and pack.

Grading.

The chief purpose of grading tomatoes is to place a standardized product on the market. The most important factor is "colour-grading", but in addition, all badly misshapen ("cat-face"), blemished, and grubby tomatoes should be culled.

One of the most serious faults noticed in the market is the tendency for growers to pack "ripe" and "semi-ripe" fruit in the same case. Colour is the distinguishing feature in the maturity of tomatoes and, therefore, particular attention should be given to "colour-grading."

The correct colour grades for tomatoes are "*Semi-ripe*", "*Ripe*", and "*Factory*", and these may be described thus for the different markets.

Melbourne Market.

The Melbourne market requires tomatoes at any stage of maturity from the "*pinking*" stage until "*three-parts*" coloured. "*Pinking*" is recognized by the first flush of pink colour appearing at the blossom-end of the fruit, and tomatoes should be picked at this stage and branded as "*Semi-ripe*". The term "*three-parts*" coloured is self-explanatory, and tomatoes picked at this stage should be branded as "*Ripe*", while those in between "semi-ripe" and "three-parts" coloured should be placed in the grade which they nearest resemble. The

exception to this recommendation is that San Mazano should be fully coloured both for local and interstate markets.

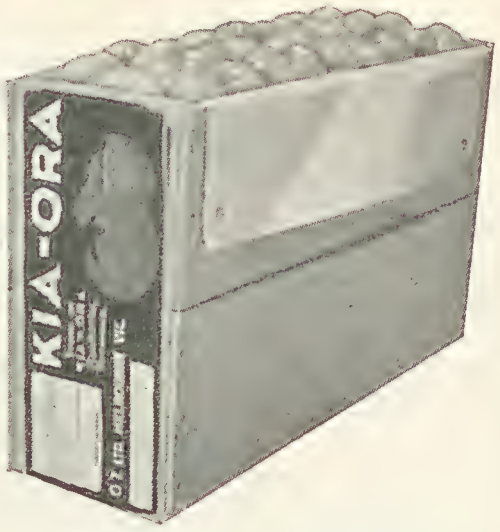
Interstate Markets.

Interstate markets require tomatoes picked at any stage after the green colour has changed to a whitish tint and *the pulp is definitely suffused with pink* until the "*early pinking*" *stage.* The former should be branded as "*Semi-ripe*" and the latter branded as "*Ripe*". Green tomatoes are useless on the interstate market.

Factory Purposes.

Tomatoes for factory purposes may be of any size and shape, either green for pickles, or fully ripe for pulping, but must consist of sound wholesome fruit. If growing exclusively for pulp or canning purposes, detailed information will be found in the section entitled "*Marketing*".

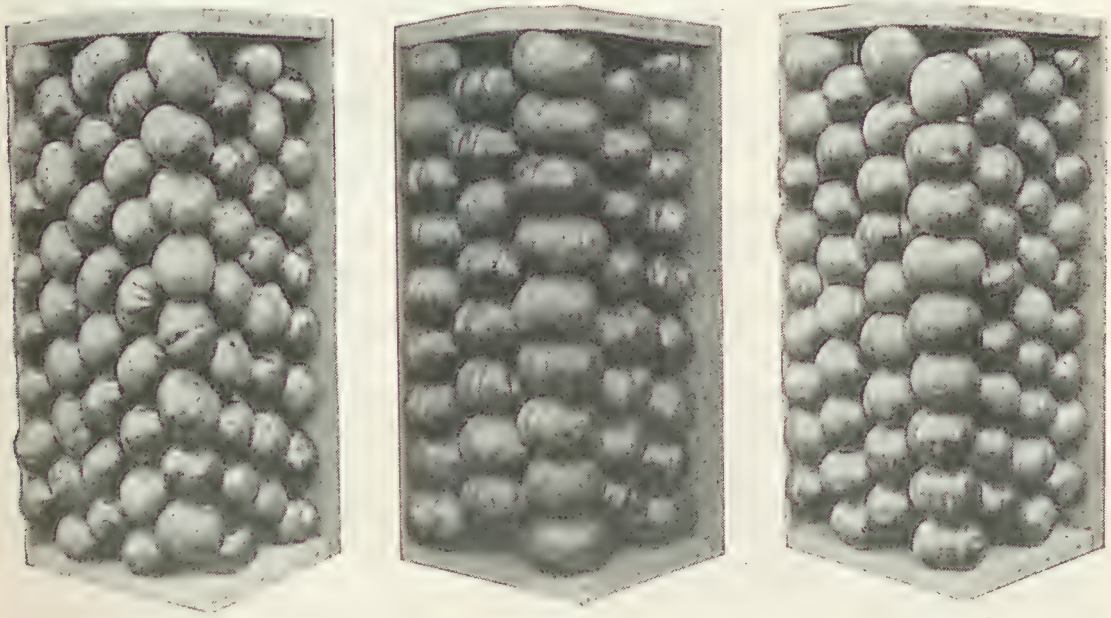
If the colour-grading is carried out as described above, the tomatoes will be fairly even in colour by the time they reach the market. When tomatoes are not properly graded and packed, they must be sold cheaply. The buyer classifies them at his shop, and retails them according to the grades, gaining a profit which, if a little care had been taken, would normally be received by the grower.



A finished pack in the Half-Standard case showing the height the fruit should be above the top of the case before lidding. This also applies to Half-Dump and Long-Bushel cases.

Packing.

Tomatoes are probably the easiest of all fruit to pack, but care must be exercised. Some consider that, owing to the irregular shape of some varieties, it is impossible to pack them as



3-2 pack *2-2 pack.* *2-1 pack.*

The Half-Dump case showing three different packs. Note.—The method of placing the tomatoes in the bottom layer for each of these packs is exactly the same as that shown on the top layer. Remember that the fruit in the second and succeeding layers is placed over the spaces and not directly on the top of the fruit beneath.

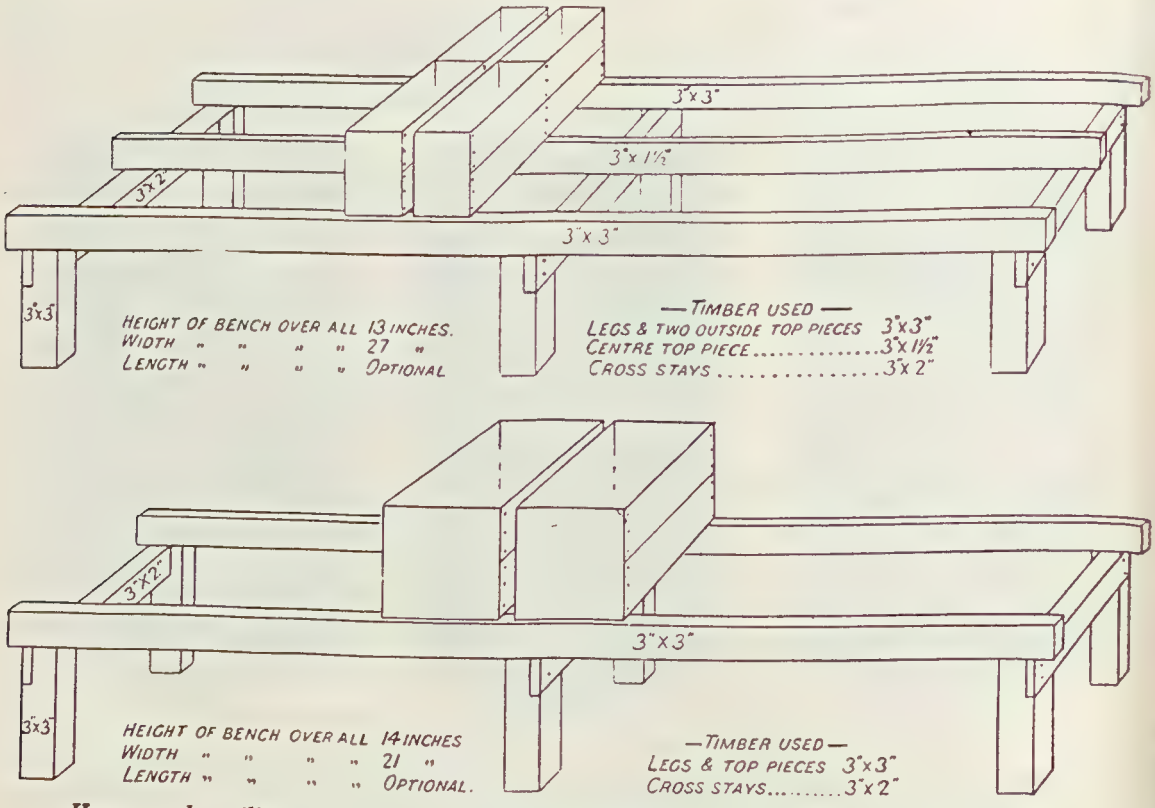
attractively as other fruit. Experience, however, has proved the contrary, and with the diagonal "cheek" system of packing, which is shown in the illustrations, it is found that all sizes can be properly packed by using not more than nine or ten different counts, or packs, which will embrace all the commercial sizes of tomatoes. This number of packs is not excessive for, by comparison, the apple grower has to employ approximately 22 packs and the citrus grower 23 packs in order to present their fruit in an attractive manner.

The diagonal "cheek" system of packing is recommended for tomatoes, because it eliminates the possibility of any two fruits resting directly upon one another in any direction. It is also very exacting regarding sizes, so much so that the packer finds himself unconsciously influenced to select fruit of uniform size. The diagrams and illustrations show exactly how the fruit is placed. When the bottom layer is packed, care should be taken to see that the tomatoes in each succeeding layer are placed in the pockets, or spaces, caused by the system of packing and do not rest directly on top of the tomatoes beneath. *Do not forget to place each tomato on its cheek and not with the blossom-end, or stem-end, facing upwards.*

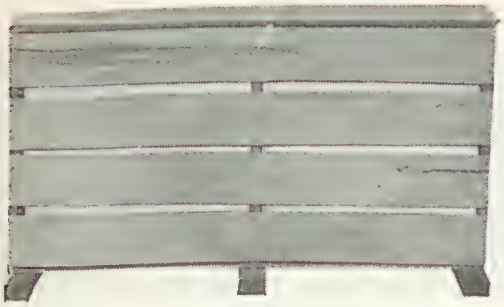
Tomatoes should never be packed with stalks adhering to them; those that have been accidentally missed in harvesting should be removed during the operation of grading. In addition, badly deformed, diseased, or cat-faced tomatoes should not be packed with the good fruit.

The only instance when stalks are retained is when the fruit is sold as "cocktail" tomatoes, and this demand is for very small fruit of an inch in diameter and smaller. Under these conditions each tomato should be clipped with about half an inch of stalk adhering to it and carefully placed in the punnet or other small container which has been previously lined with foliage or some such attractive medium prescribed by that particular trade.

The height of the fruit in the case before the lid is nailed on is very important. Packing



Home-made nailing down benches suitable for Half-Dump case (above) and Long-Bushel case (below).



In the absence of the home-made nailing down benches, the ends of the cases should rest on battens, thus relieving the pressure which otherwise would come on the fruit if cases were nailed on the bare floor.

tomatoes to the correct height in the case and the snugness of the specimens in each layer are important features for safe carriage over long distances. The fruit should be packed about an inch above the top of the case, and, if possible, a few hours should elapse before the lidding operation. This permits a certain amount of natural shrinkage of the fruit to take place. Where cases are packed the day previously, the lids should not be nailed down until the following morning, if possible. In all instances the cases should be lined with clean, white lining paper; newspapers is objectionable to the trade and should not be used.

Tomatoes should be packed in either the long bushel case, the half dump case, or the half standard case. When good prices are obtainable, packing in half cases is recommended. This applies to both interstate and local markets.

For the better class varieties such as Red Marhio, Eccles Surprise, &c., the half standard case should always be used. The rough, crinkled, or Chinese types, unless specially selected, should be packed in the long bushel case.

Branding.

The final operation in the packing shed is that of branding the cases. Appropriate words and figures neatly stencilled, assists classification at the market.

Much confusion is frequently caused by unnecessary stencil marks, therefore care should be taken to stencil or label the cases only with marks essential for identification, for example:—Brand initials, surname, and address, or registered brand of the producer, also quality and size of the tomatoes, such as—

T. JONES, ECHUCA. SEMI-RIPE.
3 INCHES AND OVER

as well as the agent's name and address.

All branding should be in letters of not less than $\frac{3}{4}$ inch in height if stencilled on the case, and not less than $\frac{1}{4}$ inch in height if printed on a label.

The best brands of tomatoes on the market are now graded and packed like oranges. The illustrations and packing charts in this article prescribe the manner in which the fruit should be presented.

Specimen Copy of Brands Desired by the Market for Each End of Fruit Cases.

One End of Case.

T. JONES, ECHUCA.

TOMATOES.

SEMI-RIPE. 3 INCHES & OVER.

Other End of Case.

AGENT'S NAME

AND ADDRESS.

Marketing.

The successful marketing of tomatoes depends upon six salient points, namely:—The production of suitable varieties to meet a popular demand; correct stage of maturity at which to harvest the fruit—this depends upon whether the tomatoes are for the interstate trade or metropolitan markets; grading; sizing; packing; and finally the presentation of the finished product.

If growing tomatoes by contract or, for example, factory purposes, the following details of what is required may be of interest. Good sound fruit, fully matured, but not overripe,

with a bright-red colour in the flesh will be an attractive article. The outside colour of the skin is not always an indication of the colour of the flesh, because some varieties have a highly-coloured skin and comparatively pale-coloured flesh. A high percentage of solids in the flesh is necessary. This means the fruit should not be watery. A good-flavoured tomato is also essential, which means that a very high acid ratio is not desirable.

Some varieties are more suitable than others, therefore it is recommended that each grower include a small area of a good canning type each season until one is found to suit the locality. It is recommended also that a few plants of Red Marhio be mixed in with all Victorian main crop varieties with a view to improving the quality by inter-pollination over a period of years.

Salient Points for the Packer.

Sizing, grading, and packing should be treated as separate operations.

Use a partitioned packing bench with eight divisions to facilitate the sizing and grading of your tomatoes. (See illustration.)

Grade for colour. Sort the coloured (more mature) from the less mature tomatoes and pack into separate cases to avoid loss.

The diameter of a tomato is measured from cheek to cheek, not from stem to eye (blossom-end).

All tomatoes should be placed on their cheeks in the respective packs to produce an even surface on each layer.

The correct placing of the first layer is the most important factor in attaining correct height for the pack.

An attractive case.

It is the size of the "pockets" or spaces between the fruit that regulates the height of the fruit in the case. The top layer should be about an inch above the top of the case before the lid is nailed on.

Fruit in the second, and each succeeding layer throughout the case should not rest directly on top of the fruit beneath, but in the spaces, so that no two fruits rest directly on top of each other in any direction.

If it is possible, the lids should not be nailed on tomato cases immediately after packing; allow a few hours for normal shrinkage to take place.

Very slack packing will cause bruised or squashed tomatoes by continual shaking during transport.

The outside layers should be a true indication of the size and the quality throughout the case.

Don't nail down on the bare floor; place battens beneath (see illustration) or use a nailing bench.

Use every effort to establish a reputation for your tomatoes. Attention to details pays handsomely.

A small consignment of tomatoes packed in the Half-Standard case, showing external presentation of the finished article.

Charts for Packing TOMATOES in the LONG-BUSHEL, HALF-DUMP, and HALF-STANDARD Fruit Cases.

The Best Brands of Tomatoes in the Market are now graded and packed like Oranges.

CHART I.—FOR TOMATOES IN THE "LONG-BUSHEL" CASE.
26 inches x 6 inches x 14¼ inches, inside measurements, clear of the division.

Approximate Size.	Pack.	Layer.	Layers.	Total.	Remarks.
Inches.					
..	2–1	7 x 7	7	294	Angle pack
2¼	2–1	7 x 6	7	274	Angle—small to medium 2¼ inches
	2–1	6 x 6	7	252	Angle—medium to large 2¼ inches
2½	2–1	6 x 5	7	232	Angle—average 2½ inches
2¾	2–1	5 x 5	6	180	Angle—small to medium 2¾ inches
	2–1	5 x 4	6	162	Angle—medium to large 2¾ inches
3	2–1	4 x 4	6	144	Angle—average 3 inches. Pack more loosely than usual. Reverse the first two tomatoes
3¼	1–1	5 x 5	6	120	Angle—average 3¼ inches. Pack more loosely than usual
3½	1–1	6 x 5	5	110	Angle—small to medium 3½ inches
	1–1	5 x 5	5	100	Angle—medium to large 3½ inches
3¾	2–1	3 x 3	5	90	Stylar to side—average 3¾ inches

CHART II.—FOR TOMATOES IN THE "HALF-STANDARD" CASE.
Inside measurements, 18 inches long, 5¼ inches wide, 11½ inches deep.

Approximate Size.	Pack.	Layer.	Layers.	Total.	Remarks.
Inches.					
2¼	2–1	9 x 9	7	189	Pack more loosely than usual
	2–1	9 x 8	6	153	Pack more tightly than usual
2½	2–1	8 x 8	6	144	Normal pack
	2–1	8 x 7	6	135	Normal pack
	2–1	7 x 7	6	126	Normal pack
	2–1	7 x 6	6	117	Pack more loosely than usual
2¾	2–1	6 x 6	6	108	Five layers if globe shape
	2–1	7 x 6	5	98	Stylar ends face sides of case (pack tightly)
	2–1	6 x 6	5	90	Stylar ends face sides of case (pack tightly)
3	2–1	6 x 5	5	83	Stylar ends face sides of case (pack tightly)
and	1–1	8 x 8	5	80	Pack more tightly than usual
over	1–1	8 x 7	4	60	Five layers if globe shape
	1–1	7 x 7	4	56	
	1–1	7 x 6	4	52	
	1–1	6 x 6	4	48	

Chart III.—For "Half-Dump" Cases made on the Wide System.
Inside measurements, 18 inches long, $8\frac{2}{3}$ inches wide, $7\frac{1}{8}$ inches deep.

Approximate Size.	Pack.	Layer.	Layers.	Total.	Remarks.
Inches.					
..	3-2	9 x 9	4	180	
	3-2	9 x 8	4	170	
$2\frac{1}{4}$	3-2	8 x 8	4	160	
	3-2	8 x 7	4	150	
$2\frac{1}{2}$	3-2	7 x 7	4	140	
	2-2	9 x 9	4	144	Flat shape varieties
	3-2	7 x 6	4	130	Pack more loosely than usual
	2-2	9 x 8	4	136	Flat shapes. Pack more loosely
	3-2	6 x 6	4	120	Pack more loosely than usual
	2-2	8 x 7	4	120	Pack more loosely than usual
	2-2	8 x 8	4	128	Flat shapes. Pack more loosely
	2-2	7 x 7	4	112	Pack more loosely than usual
$2\frac{3}{4}$	2-2	7 x 6	4	104	Pack more loosely than usual
	2-2	6 x 6	4	96	Pack more loosely than usual
	2-2	8 x 8	3	96	Flat shape varieties
	2-2	8 x 7	3	90	
	2-2	7 x 7	3	84	
3	2-2	7 x 6	3	78	
	2-1	9 x 8	3	77	Flat shape varieties
	2-2	6 x 6	3	72	
	2-1	8 x 8	3	72	
$3\frac{1}{4}$	2-1	8 x 7	3	68	
	2-1	7 x 7	3	63	Pack more loosely than usual

Chart IV.—For "Half-dump" Cases made on the Narrow System.
Inside measurements, 18 inches long, $7\frac{1}{8}$ inches wide, $8\frac{2}{3}$ inches deep.

Approximate Size.	Pack.	Layer.	Layers.	Total.	Remarks.
Inches.					
..	3-2	7 x 6	6	195	Pack more loosely than usual
	2-2	9 x 9	5	180	
	2-2	9 x 8	5	170	
$2\frac{1}{4}$	2-2	8 x 8	5	160	
	2-2	8 x 7	5	150	
$2\frac{1}{2}$	2-2	7 x 7	5	140	
	2-2	7 x 6	5	130	Pack more loosely than usual
	2-2	6 x 6	5	120	Pack more loosely than usual
	2-2	6 x 5	5	110	Pack more loosely than usual
$2\frac{3}{4}$	2-1	9 x 8	4	102	Pack more tightly than usual
	2-1	8 x 8	4	96	
	2-1	8 x 7	4	90	
	2-1	7 x 7	4	84	
3	2-1	7 x 6	4	78	
	2-1	6 x 6	4	72	
$3\frac{1}{4}$	2-1	6 x 5	4	66	Pack more loosely than usual
	2-1	5 x 5	4	60	Pack more loosely than usual
$3\frac{1}{2}$	2-1	6 x 5	3	50	

Table Poultry Production

By H. F. Clinton, Poultry Expert.

HIGH quality products stimulate consumption, but poor quality discourages it. In table poultry quality is primarily a matter of breeding, feeding, and care. The production of the highest class of table birds depends upon the selection of breeds specially suitable for the purpose, which will mature rapidly and respond well to the fattening process.

In Victoria there is comparatively little specialization in this class of trade, as egg-production has proved to be the most profitable branch of poultry-keeping when birds are reared in large numbers. On the general farm, birds are kept to supply eggs both for the house and for sale, and to provide poultry for home consumption. On specialized egg farms the marketing of poultry is a secondary proposition, and most of the birds are surplus males and stock, principally hens, that have become unprofitable.

What is the best breed? This is a question often asked by the beginner in poultry-keeping. From their remote ancestors, the jungle fowls, the present-day domestic fowls have originated. Breeders in all parts of the world have developed these birds along special lines. Some have been bred specially for egg production, some for table purposes, or for a combination of both; others for exhibition only. Consequently, there is no best breed for all purposes.

Poultry in this condition are always in demand.

Poor quality birds, such as these, are not wanted by the buyer.

Any variation between the flavour of the several breeds is undoubtedly due to feeding, preparation, and marketing, rather than to any difference in breed. Palatability and quality of the flesh are the most practical and important considerations; colour of skin, legs, and feathers are considerations of prejudice. A plump-breasted table bird of good quality will naturally have a better flavour than will a poor bird, but it should be remembered that there are often differences in constitutional vigour even amongst birds of the same breed.

The most highly developed breeds for egg-production are White Leghorns and Australorps. In Victoria, the White Leghorn is very popular. It belongs to the Light Breed group, and though by no means an ideal bird for the table, large numbers are sold locally for this purpose. The cockerels are very seldom up to the desired standard when marketed, though with careful attention and feeding they could be greatly improved.

The Australorp belongs to a group known as Heavy Breeds. It is classed as a dual-purpose variety, i.e., a good layer, and also one

suitable for the table, but as a table bird it is not considered to be equal to some of the other heavy breeds which have been specially developed for this purpose. The quality of the cockerels usually marketed also leaves room for improvement.

The table birds mostly in demand on the English market are the best heavy breeds, possessing white skin and legs, such as the Sussex, Buff Orpington and others, some of which are not readily obtainable here, or a cross produced by mating an Indian Game male with Buff Orpington females or other heavy breeds. In some parts of the world, breeds other than those with white skin and legs are equally in demand, such as Plymouth Rocks, Wyandottes, Rhode Island Reds, Rhode Island Whites, &c. In one table poultry competition in England, the favourite cross was possibly the Sussex and Rhode Island Red. (A Sussex male was used in order to obtain white flesh and feathers.) Another good cross was Sussex and Wyandotte. Indian Game birds were also used, but in the first cross the flesh tended to be yellow. In England, sex-linked breeds are being increasingly used; a popular cross possessing this character is the Rhode Island Red male with Light Sussex females; the male chickens carry the plumage of the Light Sussex, and therefore may be separated from the females at the time of hatching.

There is a keen desire for birds in a good finished condition, with flesh of a good quality and white in colour, abundance of breast meat, and fine in bone. The production of birds of this class requires experience. With most heavy birds the feeding of highly fattening foods for a limited time improves the colour of the flesh greatly, especially if the foods are white.

In the early stages, the rearing and feeding of the chickens may be the same as that usually adopted with those intended for egg production, except that a little higher proportion of dried buttermilk could with advantage be included in the ration, in order to make their growth as rapid as possible.

Finally, at a suitable age, it is usual to give the birds a short period of intensive fattening. For this purpose they should be confined to small pens or fattening-coops for about two weeks, and trough-fed twice daily on wet mash only. (No grit is required.) The following ration, mixed with water to the consistency of thick porridge, is advocated:—

A fattening coop.

	Parts by Weight.
Dried milk (skim milk or buttermilk)	5
Meat meal	5
Ground wheat, or barley	30
Ground maize	30
Ground oats (good quality only) ..	30
	100

Liquid milk may be used in place of the dried product. Approximately 1 lb. of dried milk is equivalent to 1 gallon of fresh milk (10 lb.).

The fattening coops can be built 7 ft. 6 in. long, 20 inches broad, and 20 inches high, and may be divided into three compartments, each of which will accommodate five or six birds, or fifteen to eighteen birds in all. Light battens may be used, 1½ inches apart, except in front, where they should be 2½ inches apart, so that the birds can easily put out their heads for feeding from the trough, which is placed just outside. The bottom bars on which the birds stand can be made with specially cut wood, 1 inch wide at the top, 1 inch in depth, narrowing to half an inch below, so that the droppings will fall through without catching on the sides, as would happen if the bars were perfectly square. Alternately, a wire netting floor can be put in. The coops should be placed in a sheltered position, so as to keep the birds warm. Quietness and freedom from excitement are essential for rapid fattening.

The rearing of White Leghorn cockerels in battery brooders is becoming popular in Victoria. Under this system, dry mash only (with water) is kept constantly before the birds.

The age at which birds classed as chickens are marketed usually varies from about three to five months, depending upon the class of trade for which they are intended and the time of the year when they are in greatest demand.

Producers may market their poultry alive to merchants, or sell it dressed direct to the consumer. Exporters prefer to buy live poultry, as the process of dressing, packing, and shipping has developed into a specialized industry, and few producers have a sufficient number of birds to justify the expense of installing elaborate equipment for killing, dressing, chilling and packing.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	190	13	Kelly, C. ..	"Glenmore," Creighton's Creek, Euroa	22
2	Warragul High School	Warragul ..	35				
3	Payne, A. E. T. ..	"Yarra View," Lilydale	80	14	Gorman, A. W. ..	"Cathcart," Alexandra	64
4	Dennis, Mrs. A. A. ..	Frankston ..	14				
5	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	99	15	Samuel, B. T. ..	Lang Lang ..	72
				16	Powell T. S. ..	"Carellen," Mansfield	48
6	School of Horticulture	Burnley ..	6				
7	Lawrence, P. H. ..	"Rainga," Tarrawarra	59	17	Dunbar & Clark, Messrs.	"Hazeldean Dairy" Mount Dandenong	16
8	Banyule Stud Pty. Ltd.	Heidelberg ..	54				
9	McIntosh, John ..	"Burnwood," Merrigum	31	18	Richardson Bros., Messrs.	"Faldinghurst" Upper Beaconsfield	27
10	Black, Mrs. Agnes ..	Mount Noorat	40				
11	Black, Estate, Late I. S.	"The Cottage," Mount Noorat	44	19	Onley, W. H.	"Glenholme" Caldermeade	52
12	Read, John D. ..	"Springhurst Estate," Springhurst	99	20	Payne, T. E. N.	"Woodburn" Kilmore	25

Wireless Talks for Farmers

WITH the co-operation of the Australian Broadcasting Commission, the Victorian Department of Agriculture is conducting a series of wireless talks on subjects of particular interest to the man on the land. These talks are being broadcast from the regional stations, 2CO (Corowa), 3GI (Gippsland), and 3WV (Horsham) on Friday evenings, the 20-minute sessions commencing at 7.40 p.m.

The next talks will be on 9th and 23rd February and 8th and 22nd March.

Listeners desiring any information connected with the management of their farm should send a letter to Mr. J. Keane, B.Agr.Sc., Department of Agriculture, Melbourne, and a reply will be given over the air. If you do not desire your name broadcast use initials or a nom-de-plume, but do not omit to mention your district.

Charging a lime kiln with limestone for the purpose of producing burnt lime.

The Agricultural Lime Act

Brands Registered for 1940

By W. C. Robertson, Chemist

IN recent years the use of lime on the farm lands of Victoria, both arable and pasture, has been steadily increasing, probably because of the circulation of inaccurate propaganda as to the advantages and merits of "liming." A recent report states that a salesman travelling the wheat districts of the Wimmera and Mallee has been advising farmers to use lime on their wheat lands although departmental trials in the field have definitely proved that "liming" produces no increase in the yield of wheat. Should field trials prove a lime deficiency in these wheat fields at any time in the future, the local lime deposits no doubt will be exploited to provide the need at a price which will not include cost of transport from the southern parts of the State.

Some years ago a bold attempt was made by a company to sell quantities of Western District agricultural lime in the Mildura district irrespective of the fact that lime abounds in the under-subsoil over a large area of that settlement.

The Agricultural Lime Act aims at protecting the man on the land in his purchases of agricultural lime, but he must use his own judgment as to whether the soil on his holding or any part of it, requires dressing with this important chemical. After that, he must decide which form to buy, i.e., the oxide, the hydrate or the carbonate.

Generally speaking, the orchard, citrus grove, market garden and flower farm, will benefit from periodic applications of agricultural lime preferably in the burnt and slaked condition. Some areas of pasture land also respond to dressings of agricultural lime.

The carbonate as chalk or ground limestone, which is the cheapest form of agricultural lime, is probably the best for this purpose, but there are many practical men who prefer the burnt and slaked lime for application to pasture. In cases where the soil is heavy and has a poor physical condition, an application of the more active form of lime i.e. either the oxide or hydrate often proves beneficial to both soil and pasture.

As far as pasture land is concerned, the best plan is for the farmer to determine for himself whether lime will be beneficial. This can be done by conducting his own trials on carefully selected plots in two or three areas varying the lime dressings from light to heavy and noting results over a period of two or three years.

The list of registered brands for agricultural lime appears in this issue and it provides details of the composition, physical condition and price per ton of every brand on the market in Victoria. The brands are registered under three headings, viz.:—Ground Burnt, Agricultural Slaked, and Ground Limestone or Chalk. The latter is generally termed mild lime while the Ground Burnt and Slaked are regarded as active.

A chalk pit in Gippsland. The roof in the foreground covers the deepest section of the pit.

There is a distinct difference between the three forms. Burnt lime is lime in the strictest sense of the term. It consists of calcium oxide but in the case of agricultural ground burnt lime the compound is more or less contaminated by hydration (to slaked lime) and carbonation (to calcium carbonate) so that it is a mixture of the three forms with lime or calcium oxide predominant. Similarly with agricultural slaked lime, lime in the slaked form, i.e., hydrate, will predominate, and there is usually a proportion of lime present as carbonate but generally no oxide. In the case of ground limestone or chalk, however, the lime is present only as the carbonate which is the most stable compound of the three.

The average composition of the four brands of lime registered for 1940 under the heading of "Ground Burnt" is as follows:—Lime (CaO)—82·87 per cent. The degree of division or fineness, i.e., the

A dressing of lime assists in the decomposition of a green crop ploughed under.

amount that will pass through a 20 mesh sieve—63·75 per cent. The average price per ton is £3.

The average price for each one per cent. of lime per ton is 8.7 pence, an increase of approximately 5 per cent. on the previous year's figures.

There are six brands of slaked lime registered with an average composition of:—Lime (CaO)—61.01 per cent., degree of fineness 75.5 per cent. and an average price per ton of £2 7s. 11d.

The average value of each unit in slaked lime, i.e., one per cent. of lime (CaO) per ton is 9.4 pence, an increase of 5.6 per cent. compared with 1939 figures.

In the case of the eight brands of ground limestone or chalk which are registered, the average composition is 48.87 per cent. of lime (CaO) with a degree of fineness of 79.3 per cent. passing through a 20 mesh sieve. The average price per ton is £1 6s. 4d., and the calculated average unit value for each 1 per cent. of lime per ton is 6.46 pence—an increase of 3.2 per cent. compared with the price and values of 1939.

LIST OF AGRICULTURAL LIMES REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE AGRICULTURAL LIME ACT 1934 (No. 4271) FOR THE YEAR 1940.

General Description.	Brand.	Calcium Oxide.	In the Form of—	Equivalent to Calcium Carbonate.	Magnesium Oxide.	In the Form of—	Degree of Fineness. Material Passing Through a 20-mesh Sieve.	Price per Ton in 11-ton Lots.	Manufacturer.
		%		%	%		%	£ s. d.	
Agricultural Lime—Ground Burnt (unslaked)	Lilydale, No. 1	87·70	Mainly oxide	156·90	5·00	Mainly oxide	65·00	3 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
„ „ „	„ No. 2	80·00	„	143·00	5·00	„	60·00	2 15 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
„ „ „	Kurdeez ..	80·00	„	143·00	1·52	„	55·00	3 0 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
„ „ „	Kawa ..	83·80	„	149·70	1·20	„	90·00	3 0 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Agricultural Slaked Lime	Lilydale ..	60·00	Hydroxide and carbonate	107·23	3·00	Mainly hydrate	55·00	2 0 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
„ „ „	Wimmera ..	67·60	„	120·60	1·40	„	99·00	2 12 6	J. H. McClure, Mitre Horsham
„ „ „	White Rock ..	60·00	„	107·00	2·00	„	72·00	2 5 0	White Rock Lime Co. Pty. Ltd., 19 Queen-street, Melbourne
„ „ „	Snowflake ..	60·00	„	107·10	1·80	„	75·00	2 5 0	Evans Bros. Pty. Ltd., Yarra Bank-road, South Melbourne
„ „ „	Bulldog ..	51·80	„	92·40	·80	„	60·00	2 5 0	Bulldog Lime Co. Pty. Ltd., 344 Swan-street, Richmond, E.1
„ „ „	Kawa ..	66·70	„	119·10	1·20	„	92·00	3 0 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Ground Limestone or Chalk	Lilydale ..	50·00	Carbonate	89·50	3·00	Carbonate	95·00	1 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
„ „ „	Applim ..	51·10	„	91·20	1·20	„	98·00	1 7 6	Ammonia Products Pty. Ltd., 360 Collins-street, Melbourne
„ „ „	Walker's ..	44·80	„	80·00	·61	„	75·00	1 5 0	David Walker, Waverley Lime Works, Lara
„ „ „	Lara ..	45·00	„	80·00	1·50	„	80·00	1 10 0	Lara Fertiliser and Lime Co., Lara
„ „ „	Kurdeez No. 1	47·60	„	85·00	1·00	„	80·00	1 5 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
„ „ „	Kawa ..	51·40	„	91·70	1·20	„	75·00	1 5 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
„ „ „	Lilydale Lime Nibs	50·00	„	89·50	5·00	„	51·00	1 2 6	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
„ „ „	McInnes' ..	51·00	„	91·10	1·00	„	80·00	1 10 6	A. C. McInnes, Macarthur

Melbourne, 3rd December, 1939.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

Candying Citrus Peels

By Miss A. Knight

WHEN candying lemon peel, it is advisable to select fruit free from skin blemishes of any kind; a scabby or damaged skin will spoil the appearance of the finished product. Wash or scrub the lemons thoroughly clean; then cut them through from end to end, using a very sharp knife, so that the cut edges will not be roughened.

The juice should be extracted from the halved fruit. If a cone squeezer be used for the purpose, care should be taken to see that the tip or point of the squeezer does not penetrate or bruise the skin. The juice may also be preserved and used for summer drinks and for many culinary purposes. It is, in fact, equally as valuable as the peel.

The lemon skins, or caps, should be immersed in a solution of salt water for the purpose of extracting some of the bitterness from the skin. To make the solution, allow ½ lb. salt to each quart of water, and stir until dissolved. A sufficient quantity of brine should be made to completely cover the peels When the salt is thoroughly dissolved, pour the liquid over the caps, and allow them to remain in it for several days—about a week or longer if convenient.

After salting they should be rinsed thoroughly to remove the salt, either by running water or by several changes of water. The freshened peels or caps should then be put into the preserving pan, covered with fresh water, and boiled gently until tender. Try them now and again with a cooking needle; this should penetrate them easily, but they should not on any account be allowed to become soft enough to break or fall out of shape. When they are sufficiently boiled, the pan should be removed from the heat. The peels should be lifted out, and drained on a sieve, and allowed to become cold.

Sometimes the insides of the peels are cleansed by removing the membrane and soft white pith which lines the inside of the skins; if this is desired, it is best done at this stage, as the pulp has then become soft with the boiling. Gently scrape the caps with a spoon until clean, and then rinse them so as to remove any little particles that may be adhering to them.

The peels are then ready to be put into the syrup, which should be kept clean and clear. If the caps are packed one inside the other loosely, they will fit into a smaller container than would be required if they were put in without packing.

There are two ways of syruping the peels. The first is to make the syrup of full strength. To do this, add 16 lb. of sugar to a gallon of water, which should then be boiled for five minutes; pour it over the peels, and allow them to steep in it for an indefinite period, but at least seven days.

The other method is to commence with a weak syrup made by boiling for five minutes 4 lb. of sugar to each gallon of water. Allow the liquid to cool to about 200°F., and then pour it over the peels. Leave them to steep in this for about 24 hours. At the end of that time the syrup will be a little weaker, the peels having absorbed a certain amount of sugar from it; therefore, it will require strengthening by the addition of more sugar. To do this, the syrup should be drained off and brought to the boil, and 3 lb. of sugar added for each gallon of liquid. Boil for a few minutes, and pour again (while hot) over the peels. If the syrup is skimmed during each boiling it helps to keep it clear.

The syrup will need strengthening in this way on three successive days; allow the same amount of sugar each time. After the third strengthening, let the peels remain in the syrup for three or four days; then add another 3 lb. of sugar for each gallon of syrup. Therefore, an interval of one day only should be allowed

Candying Lemon and Orange Peel.
(The final dipping in the syrup.)

between each of the first three additions of sugar; then an interval of three or four days when the final 3 lb. is added. The total quantity of sugar used will be 16 lb. to each gallon of water. By adopting the gradual process, the peel becomes permeated evenly throughout, and is generally a little more satisfactory than that put directly into the full-strength syrup, though the use of the full-strength liquid is a much quicker process.

The lemon peels must not be allowed to float while steeping in the syrup, but must be completely immersed in the syrup the whole time. The peel may be left in the final syrup as long as convenient, and portions may be taken just when needed. It is quite as serviceable for general use when in this state as when dried and candied.

To Candy the Peel.

Remove the peels from the syrup, and place them on a sieve to drain. When well drained, place them on trays, and dry them in a cool oven. Be very careful not to scorch them. When the surface moisture has evaporated, they are ready for the candying. To make a coating or dipping syrup, allow 2 lb. of sugar to each pint of water, and boil to 232°F. Immediately that temperature is reached, remove the pan from the fire and stir till a very slight cloudiness appears through the syrup. The operator should be careful to see that the liquid is not over-stirred.

If the pan of dipping syrup could be set inside a vessel of hot water during the dipping, the work would be more satisfactory, as an even temperature should be maintained throughout the process.

When the syrup shows a cloudy appearance, quickly dip the dried peels in it; then place them to drain with the hollow side uppermost, so that the syrup will drain into the hollow and form the piece of candy which we usually see in the finished product. When the syrup has set, the peels should be clear, firm, and nicely coated with candy.

Orange Peel.

Either the sweet or the bitter orange peel may be preserved in a somewhat similar manner to that described for lemon peel, with this difference, that the orange peel should be boiled for a less time than is necessary with the lemon. Another difference is that the Seville orange requires a longer immersion in the salt solution than does the lemon; it should be left in it till the bitterness of the peel is sufficiently reduced.

Citron Peel.

The citron also makes a nice candied peel. It is usually pricked through several times on each cap, so as to assist the sugar permeation. The treatment otherwise is practically the same as for the lemon.

If any peels be broken or damaged during the candying process, they should not be wasted, but may be shredded and stored for use when wanted. A mixture of orange, lemon, and citron peel makes a better flavouring than does the shredded peel of any one of the varieties.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

AFTER the cool and moist conditions experienced during November and December, the hot weather in January no doubt found some weak spots in most gardens. In some cases, casualties amongst the more tender plants and those perennials that were not well established would be numerous. The lawns no doubt developed brown patches, but in many cases, this is not so serious as it looks. The browning may be caused by excessive growth of the annual winter grass in the mild weather, with the result that the hot spell withered it, giving the lawns a shrivelled dead appearance. Watering thoroughly will encourage the hardier lawn grasses to come away, and the lawn will soon develop a much more pleasing appearance.

Seeds of antirrhinum, calendula, carnations, pansy, viola, winter flowering sweet pea and Iceland poppy may be sown now. Transplant seedlings of African marigolds for late flowers, Iceland poppy, carnations, calendula, pentstemon and winter flowering stock. This is also a good time to prepare the ground for planting early next month daffodils, freezias, hyacinths, iris, agapanthus, ranunculus and anemone.

The daffodil is a hardy plant, easy to grow and produces a flower that lasts well and with the beautiful colors and types of blooms, a good selection may be made to give flowers from August until the end of October. The objection that is sometimes raised is that only one flower per plant is produced. This may be so, but what a beautiful and long lasting one.

Although daffodils will grow in any well drained garden soil, they do best in a good heavy loam which is very well drained. Plant in a good sunny position, but if possible, one that is sheltered from the prevailing winds. The soil should be well worked to the depth of a foot or so, and half trenching should be carried out when small areas are being planted. The planting should take place not later than March. This gives the bulbs a good chance to produce a satisfactory root system before the flowering period. The depth to plant is mainly governed by the type of soil and the size of the bulb. The lighter the soil, the deeper the planting and the larger bulbs are planted deeper than the smaller ones. In an average soil, the neck of the bulb should be covered with about 3 inches of soil.

When planting, give a dressing of a mixed fertilizer, containing about three parts of superphosphate to one part of potash. In light soils, market garden manure is very useful. Give about 3 oz. per square yard. Repeat this dressing just after the foliage shows through the ground, and lightly hoe it in.

For exhibition blooms, it is advisable to cover the flowers, but very good flowers may be obtained without any covering at all. As the bulbs are improved by having a dormant summer period, it is advisable to grow them in a bed by themselves, so that they may be left undisturbed after flowering.

The bulbs should not be lifted until after the foliage has died down, and unless the area is required, it is better to lift them about every third or fourth year. After lifting, they should be divided and replanted almost immediately, as they do not improve by being kept out of the ground. There are so many varieties to choose from that a catalogue should be obtained and selections made. King Alfred, Camberwell King and Golden City are three good yellow trumpets. Burwood, Austral Queen and Honour, are good bi-colour trumpets. Cinder, Carngham and Comet are incomparabilis types, with the small reddish orange cups. This type is very popular, because of the distinctive colouring, but they are much smaller than the trumpets. Although there are ten divisions in the daffodil group, the above mentioned ones are most popular.

Vegetables.

The warmer weather of January has ripened the summer vegetables, and, in addition to regular watering and hoeing, the vegetables should be kept well picked. If they are neglected and allowed to ripen, the plant soon commences to die off. This refers particularly to beans, tomatoes and cucumbers.

Make further sowings of lettuce, early cabbage, cauliflower, red beet, carrot, parsnip, French bean and turnip seed. Prepare the ground ready for the planting next month of onions, broad beans and peas.

Keep the soil well worked between the growing vegetables and water them as required. Remember that a good watering once a week is better than daily sprinkling, which encourages the roots to grow too near the surface.

The Broad Bean.—This is a most useful vegetable, because it is the hardiest of the bean family and is available for use from late winter until the French beans are ready to pick. The varieties commonly used are those which are shelled, and the young seeds are utilised somewhat the same as the pea family.

The broad bean may be grown in areas where the frosts are not too severe and in most soils, as long as they are well drained. In small areas, the soil should be well worked to a depth of about 18 inches, and a liberal amount of animal manure worked into the soil. Plant in double rows about 2ft. 6 in. apart and give a liberal dressing of superphosphate at the rate of 1 lb. per 30 yards length of row, and work it well into the soil. The plants in the rows should be about 6 inches apart, with 4 or 5 inches between each row of the double row

Plant from 1½ inches to 3 inches deep, according to the type of soil. In order to have a succession of beans, make monthly sowings from March until June. It takes from four to five months from the time of sowing until the beans are ready for culinary purposes

When the plants are a foot or so above the ground, earth up the rows, In late autumn, aphis may attack the plant. To control them, spray with nicotine sulphate. This spray is prepared by mixing 1 oz. of nicotine sulphate with 5 gallons of water (or approximately 2 tablespoons to a kerosene tin full of water) to which has been added a little soft soap.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

THE most important orchard activity during this month is harvesting. It is one of the important operations in fruit growing, which sometimes does not receive the care and attention to detail to which it is entitled. Several reasons are advanced for this neglect. Shortage of staff and the necessity for other routine work frequently interfere with correct harvesting procedure. In some instances, fruit must be picked in a rather immature condition and, at other times, harvesting is delayed with the result that the fruit becomes over-mature on the trees, and some varieties, in this condition, fail to keep well when stored.

The harvesting of canning pear and peach crops generally receives more attention than the harvesting of apples and pears for the dessert trade. The cannery requires fruit at a definite stage of maturity and will not take delivery unless that stage of maturity has been reached. The picking of apples and pears should, nevertheless, receive at least the same careful consideration.

For the fruit to be of good eating quality when it reaches the consumer, after a storage period, it must be picked at the correct stage of maturity. In order to increase the consumption of those fruits which cannot be exported and which, of necessity, must now be placed on the local market, it is necessary, this year, more than ever before, that growers should endeavour to market their fruit in the best possible condition. It is only by giving the public attractive fruit that the marked increase in consumption can be obtained.

The Jonathan, our principal dessert apple variety, should be picked when the ground colour is changing from green to yellow. This usually occurs about mid-March. Many growers will attempt to pick Jonathans for dessert purposes during February, but, unless this fruit has attained the desired colour by this time, it will not have developed its best eating quality.

The dessert quality of fruit, at the time of consumption, depends largely upon its stage of maturity when picked, on the treatment between harvesting and storage, and the duration and temperature of storage. Immature fruit has a tendency to wither, particularly around the stem end, and sugars and flavour have not fully developed and the acidity is rather too prominent. Growers sometimes delay picking in order to allow the red colour to develop on some varieties, but more attention should be given to the development of the ground colour, and other orchard practices should be adopted to develop this red colour before the correct stage of maturity is reached.

All fruit should be handled carefully to minimize bruising and should be immediately placed in cool places, and finally, as soon as possible, in cool store.

Soft scald and breakdown are the two major disorders of the Jonathan in cool store. To overcome these troubles, promptly store the fruit at 36°F. until the end of April. During May, the temperature can be lowered to 34°F. and, from June onwards, the fruit can be held at 32°F. until the end of its storage life, which is usually about September, although, in some districts, this variety is held until November.

Many growers, to overcome the development of soft scald, have been in the habit of picking the Jonathan while it is still immature. This practice eliminated scald, but, unfortunately, the fruit lacked quality. Overmature fruit does not develop soft scald, but it is liable to become mealy and breakdown early in storage. Such fruit loses its flavour quickly.

Granny Smith, Stewarts, Dunn's, Cleopatra and Delicious apples are very susceptible to superficial scald, which takes the form of a slightly depressed brown discolouration of the skin. Losses from this trouble last season were particularly heavy. This condition can be completely eliminated by the use of oil wraps and prompt storage. In the past, growers obtained some control of superficial scald by delayed storage, but a surer method is the use of the oiled wrapping paper. Delayed storage reduces the storage life of the fruit, and only gives control to this type of scald if the fruit is picked at a particular stage of maturity.

In the citrus groves, one of the most important operations, at this time of the year, is that of the control of red scale. Fumigation is now being widely adopted, and more liquid HCN (hydrocyanic acid gas) will be used this season than for several years past. Where red scale infection is severe, fumigation should be completed as early as possible, preferably before February. If fumigation is not available, two applications of 2 per cent. white oil emulsion may be given, leaving an interval, at this time of the year, of one month between the two sprays. Lighter infestations can usually be controlled by either one fumigation at standard dosage in the autumn, or by a thorough spray application of 2½ per cent. white oil emulsion. Some growers have used the combination treatment to combat severe infestations. This treatment consists of white oil, 1 in 80, or stronger, followed by cyanide fumigation. Attention to the preparation of the trees for fumigation, and the use of adequate amounts of spray, are two essentials which growers should consider in red scale control. Another important factor is the removal or the treatment of alternative hosts near the citrus grove which might be affected by scale.

Fertilizers Act

Prosecution for Offences

On 22nd December, 1939, at the Sunshine Court of Petty Sessions before Mr. Pyvis, P.M. and a bench of honorary justices, Ellen Augusta Christina Pennell, Jessica Rita Pennell and Albert George Pennell (trading as G. W. Pennell, Burke-street, Braybrook) were charged under Section 7 and 8 of the *Fertiliser Act* 1928 No. 3680. After evidence was given that, on 13/9/39, bags of Pennell's A & A Nitrogenous Fertiliser were found unlabelled in the defendant's factory contrary to Section 7 of the Act, each defendant was fined £3.

A charge against Albert George Pennell under Section 16 was upheld and defendant was convicted. The evidence disclosed that a sample, withdrawn from a lot of 47 bags at the defendant's factory on the same date, was found on analysis to have a percentage deficiency in phosphoric acid of 9.6, which exceeded the limit allowed by the Act. On proof of a prior conviction under this Section being given the defendant was fined £20 with £4 4s. costs.

A case for obstruction under Section 31 (2) against Albert George Pennell was dismissed. A stay of 28 days was granted and an appeal has since been lodged against the conviction under Section 16 of the Act.

Pig Breeding

Market Requirements

By L. A. Downey, H.D.A., Pig Expert.

THE pork and bacon trades are making very exacting demands on pig raisers. Quality, as defined by consumers, is of the utmost importance when competition is keen for the consumers patronage, and it is necessary therefore that pig producers should make themselves familiar with trade requirements, and be prepared to meet these even as they change, so far as it is economical to do so.

While pig producers should aim at supplying the kind of pigs required by the trade they must not overlook their own interests in the industry, which is the production of marketable pigs at the lowest possible cost. Fortunately the class of pig required by the pork and bacon trades at present is also an economical pig for the farmer to produce.

Breeding, feeding and management all affect the conformation and quality of porker and baconer pigs. Of these three factors, errors in breeding are the most common cause of unsuitable pigs being marketed, but proper feeding and management are necessary for the full development of inherited characters.

Admitting that there is some variation in trade requirements, the major part of the pork and bacon trade at present requires pigs whose carcases carry a high proportion of lean meat (muscle) with a comparatively small amount of fat which should be well distributed with the lean, and a small proportion of bone. In

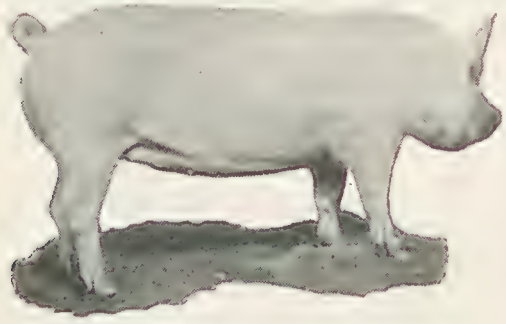


Fig. 1.—The lean pig. This long lean pig gave a good carcase.

Fig. 2.—The fat pig. This "thick" pig gave a carcase which was too fat and too short at its weight.

shape, the desirable carcase has well-developed hind-quarters, comparatively light fore-quarters and a high proportion of middle which should be long and thin, rather than short and thick. Such conformation gives a high percentage of the more valuable parts of the carcase, namely, the back, loin and ham.

When other features are satisfactory, the trade measures carcase quality chiefly by the thickness of the back fat, grades being based on this feature; a 70 lb. porker requiring approximately ½ inch and a 140 lb. baconer requiring approximately 1 inch of fat on the thinnest part of the back. These measurements cannot be applied to the live pig, and in the absence of a regular system of pig carcase grading, the producer must use his judgment in regard to the condition of his pigs, but the illustrations given herein should help growers to recognise type and condition in their pigs to a greater extent than many do at present.

How the Pig Carcase Develops.

During their growth from weaning to maturity, when fed a liberal ration, pigs pass through three more or less distinct stages. In the first stage their boney framework is growing rapidly. In the next stage their muscular development is most rapid, while in the final

stage the fat is rapidly deposited on and between the muscles giving the pigs what is termed a "finished" appearance. To give carcases, with the desired proportions of bone, muscle and fat, it is necessary that pigs should be slaughtered just as they commence the rapid fattening stage. But all pigs do not reach this stage of maturity at the same weights. Porker type pigs finish at lighter weights than do baconer types. This principle of development towards maturity is illustrated diagrammatically in Figure 3.

Figure 3 illustrates the stages of development of three types of pigs, the light porker type, the light baconer type, and the heavy baconer type. There are pigs for pork and pigs for bacon, and under normal feeding conditions the pork type does not make a good baconer and the bacon type does not make a good porker. The so-called dual purpose type of pig is neither ideal for pork nor bacon; however, environment does effect the maturity of pigs.

Pig breeders should learn to distinguish between the type, irrespective of the age or conditions of the pigs in question, and should use pork type for the production of porkers and bacon type for the production of baconers.

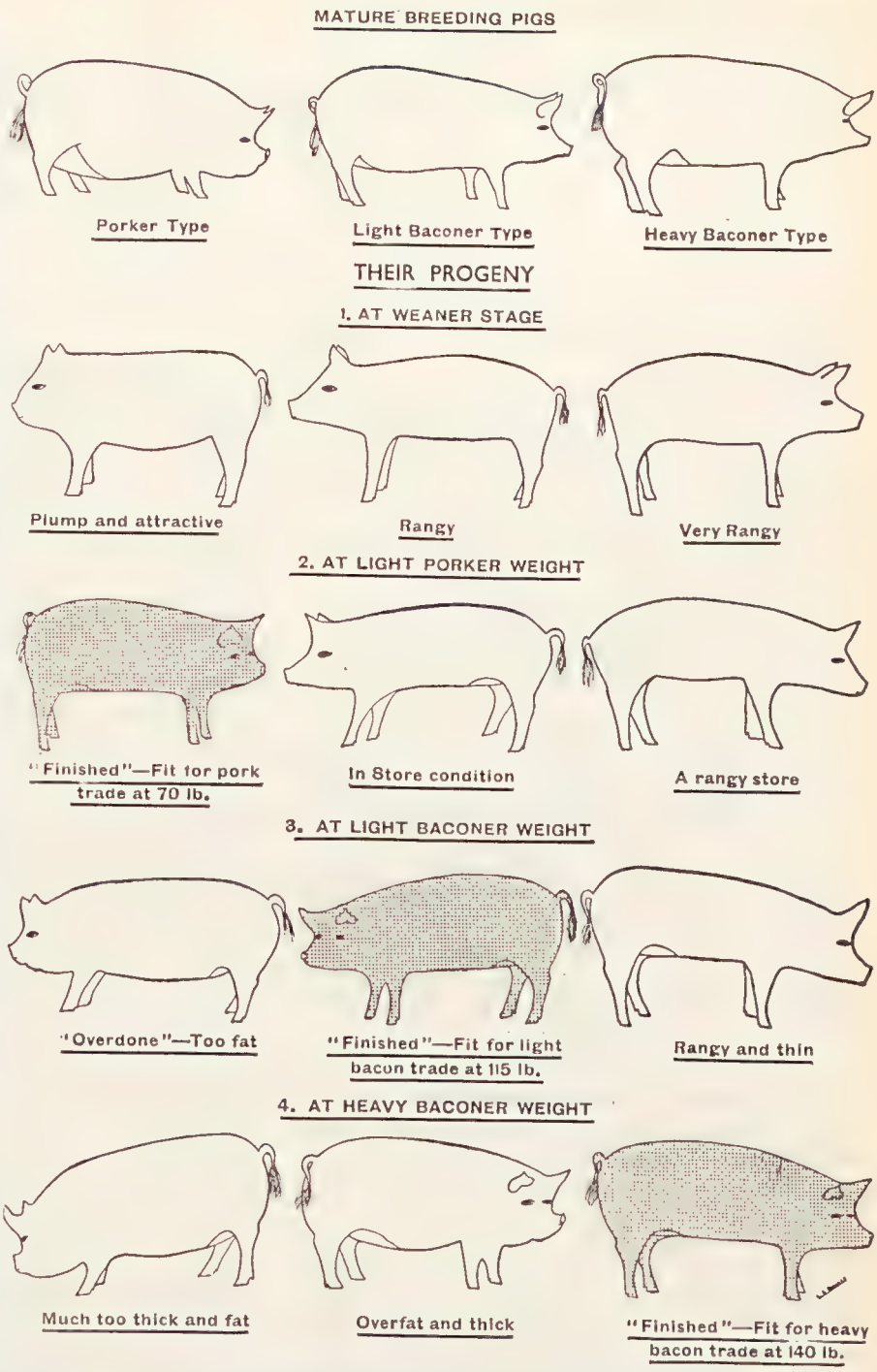


Fig. 3.—Diagrams illustrating the conformation of three different types of breeding pigs and their progeny fed under normal conditions. It will be noted that the porker type is always more plump and compact and it acquires a "finished" condition at a ligher weight than the baconer types which are immature at porker weight but are finished at their respective baconer weights.

Block by Aust. Meat Board. Illustrations adapted from Q'land Agric. Jnl.

Type More Important than Breed.

There are many breeds of pigs, all with some good features, and there are variations of type within all breeds, therefore it is not possible to declare that all pigs of any one breed are of porker or baconer type. It can be said as an example that most pigs of the Large White breed at present are of the baconer type and most pigs of Middle White breed at present are of porker type. In other words, the average type of these two breeds illustrates the difference between baconer and porker types. Type in mature breeding pigs is largely a matter of size of stature.

There appears to be a general tendency for pig breeders to select towards a smaller type even when they are producing bacon pigs, with the result that many pigs are finished before they reach bacon weights and are too fat when they are heavy enough for bacon production. This loss of size is so general that it is probably brought about slowly and without breeders recognising the fact. The probable causes for this gradual selection towards a smaller type are, firstly, that to many farmers the ideal pig is a fat pig, and secondly, the selection of future breeding stock for bacon production is done before they reach baconer weight. If the plump, finished pig is selected at light-weights the breeder is getting off bacon type, for at below baconer weight, the true bacon type pig is immature, and to most people, unattractive. Early maturity should not be confused with fast growth, as late maturing pigs, that is late fattening ones, usually gain in weight more rapidly than the early maturing porker pigs. Size in breeding pigs is a valuable feature.

Breeder's Requirements.

While striving to produce the kind of pigs required by the trade, pig breeders should also select for those features which make pigs more economical to grow.

Breeding stock should have character and stamina, their feet and legs should be strong and well placed if the pigs are to be active and grow rapidly. Teats should be plentiful, well placed and well developed in both boars and sows as this feature is not only an indication of potential production but is possibly a guide for the breeder in selecting for long bodied pigs, and long bodies are desirable for both the meat trade and for productivity in breeding sows. At least twelve, and if possible fourteen, well spaced teats are desirable.

Pig breeders should not fear loss in productivity through selecting to a type of pig to suit the trade, as records of performances of pigs taken over many years in litter recording and pig testing schemes in other countries have shown that it is practicable, by selection based on records of performance, as well as on appearance, to improve carcase quality, increase growth rate and decrease the food consumption per pound of pork produced. This has been done in at least two breeds of pigs and no doubt could be done in others.

Production Records Necessary.

Pigs carry many inherited characters, some desirable and some undesirable. Careful breeders strive to eliminate the undesirable and accentuate the desirable, and in some respects they have been successful. However, pig improvement has reached that stage when it has become necessary to use some more exact method of measuring conformation to comply with trade requirements. Further, more information is required on inherited growth and production factors so that the breed average for these factors may be improved by selection of the known good animals for breeding purposes and the elimination of the less desirable stock.

For any definite advance in genetic improvement of pigs it is very desirable to have records of performance which give the breeder such information as prolificacy and milking and mothering capacity of the brood sow, rate of growth of her progeny after weaning, their economy of food conversion, and their carcase quality. Such factors can be measured, and it is in this direction that litter recording and pig testing can help pig breeders to put their operatons on a more definite foundation than at present.

There are some features of pigs, such as character, and balance of conformation which cannot be accurately measured by a scale or rule, so judging by eye will continue to play a big part in pig improvement. A system of pig judging and selection based on records of performance and the animals' appearance will, no doubt, be adopted in Australia in due course for the betterment of the pig industry. At present, pig breeders can help themselves by weighing each sow's litter at eight weeks old to check the sow's productivity and their method of management. In addition, when buying stud pigs it is wise to enquire for production records as well as show records.

Soil Changes under Irrigated Pasture

Tests at Werribee

By F. Penman, M.Sc., Assistant Research Chemist

SUMMARY.—*Soil conditions in a somewhat salanized red-brown earth at Werribee have been examined, following nine years irrigation of mixed pasture subjected to a differential watering system. It is a natural characteristic of this soil that it has a definite clay pan at a depth of about 7 inches, with notable lightening of texture below this horizon. These and other features, which are described fully, with analytical data, link this soil very closely with soils of common occurrence in the northern irrigation districts, so that results found by pasture investigators under Werribee conditions are widely applicable.*

Physical constitution and structure of the soil are the chief factors causing poor permeability to water at this location. Irrigation has resulted in definite loss of clay from surface soil, apparently by downward washing, to the extent of some 14 per cent. of the clay content of unirrigated land. Under moderate irrigation, the loss is mainly in the finer clay (particles smaller than 0.001 mm.) while, under heavy irrigation, there is some loss also of the coarser clay particles. Accumulation of such displaced clay in the natural pores and structure channels of the subsoil probably accounts partly for an observation that it has become more difficult for the land to "take" irrigation water.

A pronounced difference in level of the soil surface, which developed during the pasture experiment, between non-irrigated and irrigated treatments, has been ascribed chiefly to expansion of the irrigated land, particularly in the subsoils, some of which have high coefficients of expansion on wetting.

In the period 1914 to 1935, soil nitrogen and total organic matter in the surface 6 inches have increased by approximately 100 per cent. on certain treatments, most of the increase being attributable to the growth of irrigated pasture. The optimum treatments (six irrigations per annum of 4-in. or 5-in.) from the aspect of amount and seasonal distribution of production, and botanical and chemical composition of herbage, are also best with regard to organic matter accumulation in the soil. Various factors are discussed in this connexion.

Irrigation under the conditions of these experiments has resulted in remarkable diminution of replaceable and available potash, the more heavily irrigated treatments having only about 20 per cent. of the amount of available potash present in the surface 6 inches of soil in the unirrigated land. To a depth of 20 inches, replaceable potash in the soil of the treatment given 36 inches of irrigation annually is only 58 per cent. of that in the treatment given no irrigation, a difference equivalent to approximately one ton of sulphate of potash per acre. While a considerable amount of this difference is accounted for by estimates of removal of potash in the form of produce, it appears that part of the loss may be attributed to direct leaching of potash and to downward movement of clay, which of course carries potash as a constituent.

Analyses show that no increase in phosphate content of soil has occurred since 1914 except on low production treatments such as that given no irrigation, although superphosphate has been applied throughout at the rate of 2 cwt. per acre per annum. This situation is in accord with annual production, on the more productive treatments, of 8,000 to 9,000 lb. per acre of dry matter averaging 0.75 per cent. P_2O_5.

PRODUCTION and character of mixed pasture under various rates and frequencies of irrrigation have been investigated since 1925 by Irrigation Officers of the Department of Agriculture at the State Research Farm, Werribee. Details of the design and results of this work have been published (1) and in 1935 the experiment was discontinued. It was then suggested that advantage be taken of the opportunity to examine the effects on soil conditions at these plots of the various irrigation treatments for pasture. The following report describes investigations conducted with that general object, and also for the purpose of specifying in some detail the character of the soil at the plot location. As the results of these trials and those of the adjoining fertilizer tests on irrigated pasture, together with those on lucerne carried out in the same locality of the Research Farm, have been of special importance in guiding the development of irrigation of these crops throughout the State, it is evident that full knowledge is desirable of the soil on which the work was conducted.

History of the Field.—Points in the early treatment of this area which are of interest in the present discussion are that in 1912 the land was sub-soiled, graded, and dressed with quicklime at the rate of 1 ton per acre and that prior to 1919 no important differential treatments were used on individual parts of the area, annual crops being grown with an occasional irrigation.

In 1919 the field was ploughed, sub-soiled, graded and check-banked for establishment of experimental plots on irrigated lucerne, including manurial trials. These tests continued until 1924, when the land was broken again, and, following a barley crop and fallow, pasture was established in 1925 for the rate and frequency of watering trials. In re-grading and re-banking, check-banks for irrigation of

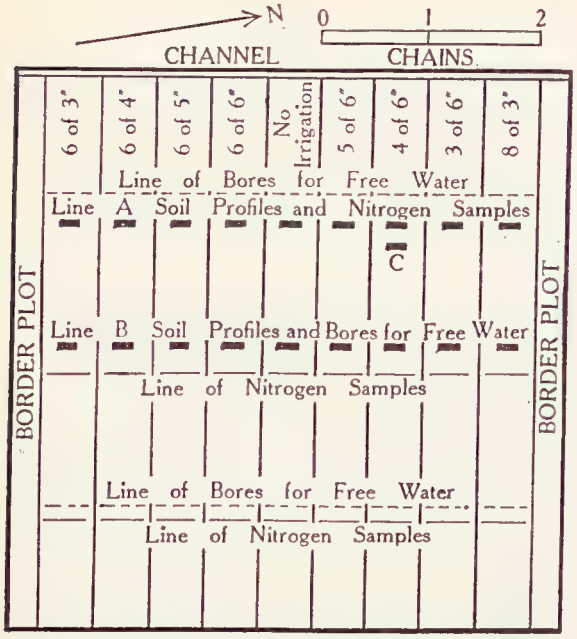


Fig 1.—Showing design of irrigated pasture experiment and location of soil sampling points.

pasture were formed in the same positions as for the lucerne trials. As shown in Fig. 1, the area of 2½ acres now concerned was laid out in nine bays, one of which was given no irrigation water, while the remaining bays received annual amounts varying from 18 to 36 inches. During the first summer of pasture establishment, the whole area, including the "No Irrigation" bay, received similar watering treatment totalling about 13 inches. As the bays were watered equally while under lucerne, differential watering therefore dates from the season 1926-1927, giving nine years effective duration to the pasture experiment.

Although all the pasture area was sown with the same mixture, which included eleven species, persistence has varied according to treatment (1). Lucerne with miscellaneous weeds and grasses has constituted the bulk of the cover on the "No Irrigation" plot, while white clover, subterranean clover, perennial rye-grass and cocksfoot were the major species on the watered bays, white clover being of special importance. These pastures were top-dressed annually with superphosphate at the rate of 2 cwt. per acre.

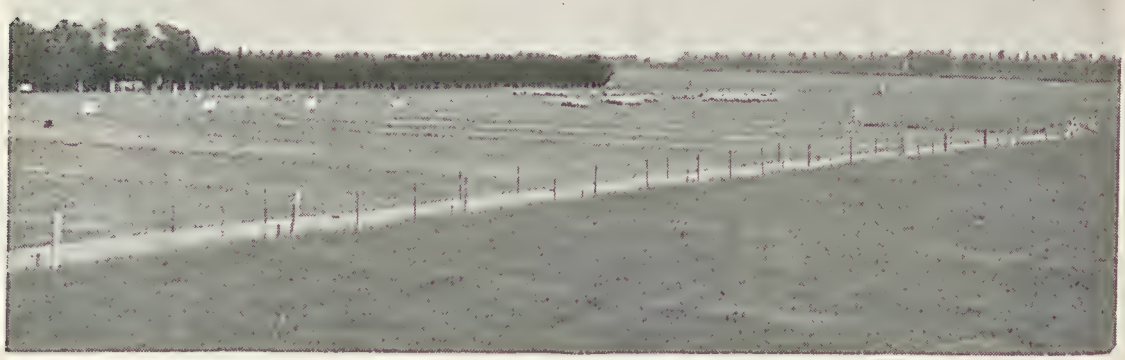
During the first three years of the test the plots were grazed, but stock were kept off in the spring, and crops of meadow hay harvested. "Yields of hay did not reflect the apparent differences in the growth of the various plots observed during the year" (1) so that, in 1929 to 1931 yield records were taken of pasture mown at frequent intervals throughout the season. In 1931-1932 grazing by sheep was adopted and yields on the various plots estimated by means of yield samples taken before and after each grazing (2).

Since cessation of the differential watering treatments in 1935, the whole area has been subjected to uniform irrigation, with the result that the former "No Irrigation" plot has developed luxuriant growth, with abundance of white clover.

In assembling details of previous treatment of the area and of the results of pasture experiments, and in the taking of soil samples, much assistance was given by irrigation officers, particularly Messrs. E. T. Beruldsen and A. Morgan.

General Soil Conditions.

The soil at the plot location is a brown loam derived from alluvial deposits from the Werribee River, conforming in general character with the "red-brown earths." The typical



A general view of the Rate and Frequency of Watering Tests at Werribee.

profile has about 7 inches depth of this surface loam, giving way fairly sharply to red-brown medium or heavy clay, which persists to 12 inches. Between 12 inches and 18 inches occurs red-brown and brown medium clay, the brown portions tending to platey structure while red-brown clay often occurs as veins, usually linked with the overlying horizon. From 18 inches to 24 inches is found yellow-brown clay loam of platey structure, changing at 24 inches to brown fine sandy loam or clayey sand, which persists to 45 inches. Within this section of the profile there occur aggregations of limestone, usually in the zone 21 to 33 inches. Apparently this limestone is concretionary; individual aggregates up to several inches in length are found and some show platey structure, while some of the smaller stone is in the form of tubes and rods. In some cases, buckshot (ironstone) concretions are present in the lower portions of this part of the profile extending to 45 inches depth.

From 45 inches to 66 inches in the typical profile is found a brown light to medium clay with small amounts of lime and sometimes with odd basalt stones, underlain from 66 inches to 84 inches by brown and grey medium clay with lime and odd basalt, grey colour becoming more prominent with increasing depth. From 7 feet to 9 feet occurs grey heavy clay with yellow mottlings and odd basalt and sometimes with large amounts of lime, chiefly in the soft form. This clay continues with little essential change to 16 feet, except that very little lime is encountered below 9 feet and basalt stone is found more frequently.

The rather peculiar type of profile described appears to be due to the burial of earlier alluvium, probably with a partly developed profile, by a further deposition of different character. Soil development in this later alluvium has resulted in the formation of clay-pan at about 7 inches from the surface, this and other features providing a close link between this Werribee soil and others which have been described in the Goulburn Valley and Rochester districts (3, 4).

Fig. 2.—Typical soil profile to a depth of 7 feet.

[Photo. B. A. Pearl.

The main features of a representative profile are shown in Fig. 2, which is a photograph of the end of a pit in the "No Irrigation" bay. The clay-pan, with well-developed cracking, is noted at 7 to 12 inches while the light textured horizons from 19 inches to 49 inches are distinguished by their absence of cracking and general uniformity. An embedded aggregation of limestone, with its surface scratched so that is shows as a white streak, may be seen extending vertically from about 24 to 30 inches, to the right of the tape. These aggregates usually occurred as elongated formations lying either horizontally or vertically, and formed a broken array throughout the soil at the depth stated. Below 49 inches, considerable amounts of soft lime and occasional small basalt stones may be noted. Evidence of the laminar structure of the horizon 12 to 19 inches is discernible in the short distances between horizontal cracks, a feature noted also in the lower parts of the clay-pan, while the upper parts of the latter show prismatic cracking, with tendency to rounding of the upper surfaces of the topmost blocks.

There are numerous evidences of movement of iron in this soil profile. The platey zone below the clay-pan shows considerable ferruginous staining along laminations and in vertical cleavages, and, especially in its upper sections, often exhibits a partly bleached character. This feature may be noted in Fig. 2 at a depth of about 14 inches. When water

Fig 3.—Soil profile associated with natural depressions. A depth of approximately 3 feet is shown.

[Photo. B. A Pearl.

incidence has been greater than normal, as in former natural depressions, a zone showing definite bleaching and concentration of iron oxide as buckshot is found. An example is shown in Fig. 3, in the horizon 16 inches to 20 inches. The occurrence of buckshot in deeper horizons has been mentioned, and in some cases these pisoliths occur in the clay-pan horizons, in one instance to the extent of 7 per cent. of the soil, and even to a small extent in the surface soil. In some of the clay horizons modified clay "pellets" have been formed, apparently by slight impregnation with iron oxide. Again, most of the sand fractions separated from these soils contained a proportion of ironstone granules, especially in the depth 12 inches to 66 inches.

The indications from the distribution of iron as discussed above are that this soil is subject to impeded internal drainage. The laminated zone below the clay-pan would appear to have particular significance in hindrance to water penetration, causing temporary water-logging at this point in the profile. This leads to partial bleaching of the soil mass in this horizon as the result of anaerobic solution of iron, which becomes localised as pisoliths of iron oxide (cf. (3)). The cause of laminations in this zone, and sometimes below it, is not clear. It may be associated to some extent with the fact that the grey clays deep in the profile have a very high expansion on wetting, suggesting the possibility of appreciable rise and fall of the soil body in accordance with changes in moisture condition of the deep subsoil. Such periodic movement might be expected to induce lamination in material containing considerable proportions of clay. It would appear however, that the lamination is due chiefly to residual structure from layered deposition of the parent alluvium. The fact that platey structure may be observed in some of the concretions of calcium carbonate in these soils may be explained on the basis of pseudomorphic development of these aggregates.

Soil Structure and Mechanical Constitution in Relation to Penetration of Water.—The surface soil is virtually structureless and has a physical constitution not conducive to free working or to water penetration. A representative mechanical composition is 22 per cent. clay, 25 per cent. silt, 45 per cent. fine sand, 5 per cent. coarse sand. The dominance of fine sand and silt are related to the fact noted (1) in practice that this soil sets hard when dry and is difficult to plough. The occurrence under the surface loam of the clay-pan with about 50 per cent. clay content and tendency to remain in a plastic condition, succeeded by a heavy laminated horizon, makes a combination of upper horizons offering only restricted facility for water movement. It has been found (1) that this land usually will not take more than three inches of irrigation water at a time, applications greater than that amount being given by means of "supplementary" waterings. The lighter zones, below the horizons mentioned, allow free movement of such soil water as penetrates to them. Although

laminar structure is often present in these zones their more sandy character and the frequent development of pores mitigate the effect of this structure on water movement. The brown light to medium clays of the deeper subsoil appear to be in good physical condition, usually crumbling readily, but below these the grey heavy clays of very plastic, dispersed character form a deep bed of material which is again unfavourable to water penetration.

There is a marked dominance throughout the profile of the finer physical constituents of soil. Mechanical analyses, set out later, show that fine sand far outweighs coarse sand in all horizons, to the extent of roughly 9 to 1 in the surface soil, 12 to 1 in clay-pans, 6 to 1 in the sandy horizons below clay-pans and 20 to 1 in the deeper subsoils below 4 feet. Thus, whatever sand is present in these soils is chiefly of the fine form and there is little coarse material in the main body of the soil to ameliorate the high proportions of clay, and lesser but considerable amounts of silt, usually found.

Soil Variability.

Variations in soil conditions throughout these plots may be considered as due chiefly to:—

(*a*) inherent soil differences from point to point;

(*b*) differences in manurial and other treatment when the area was laid out as experimental plots for lucerne;

(*c*) differences due to treatment of individual areas since establishment of Rate and Frequency of Watering tests on pasture.

While it is the purpose of the present investigation to attempt to elucidate the situation with respect to (*c*), it is evident that (*a*) and (*b*) must be given due consideration throughout. With regard to (*a*), certain important variations occur from the typical soil profile already described. Naturally there are differences in depth and character of the various horizons in different parts of the area. The surface soil, for example, is as deep as 11 inches in some spots, compared with the representative depth of 7 inches, and certain bores show a transition horizon, sometimes several inches in depth, between the surface loam and the clay-pan. Contents of clay in clay-pan samples varied from 42.3 to 55.6 per cent. and of sand from 22.2 to 37.5 per cent.

More important differences occur, in the horizons below the clay-pan, where the greatest variability is found from profile to profile. The zone from 18 inches to 45 inches is particularly variable and although it usually includes an horizon of quite light texture, as described for the typical profile, it may in some bores, show no lighter texture than that of a light clay. Sand content in horizons in this zone varies in different portions of the area over the wide range 28.0 to 59.2 per cent.

Weighted averages for sand content from the surface to a depth of 4 feet are given for eighteen profiles in Table I. Locations of the sampling points are shown in Fig. 1.

It is noted that these averages vary from 36.7 to 49.4 per cent., a wide range for a 4 ft. depth in a small area of land expected to be reasonably uniform. The probable influence of such variations on water penetration in different parts of the area is obvious. It would appear that the explanation for an observation, made by the irrigation officers, that the southern bays take water more readily than those to the north, lies partly in the lighter general texture of the soil in the southern bays. This is indicated by Table I, particularly for the bays which received six waterings of 3 inches, 4 inches or 5 inches. The northern bays also contain a larger proportion of what were formerly, and remain to some degree, local depressions.

TABLE I.—AVERAGE CONTENT OF SAND (%) TO A DEPTH OF 4 FEET.

Irrigation Treatment (per Annum).	Six Waterings of 3 inches.	Six Waterings of 4 inches.	Six Waterings of 5 inches.	Six Waterings of 6 inches.	No Irrigation.	Five Waterings of 6 inches.	Four Waterings of 6 inches.	Three Waterings of 6 inches.	Eight Waterings of 3 inches.
Line A ..	43·1	48·5	43·7	45·6	39·8	41·5	41·1	44·1	41·9
Line B ..	49·4	45·6	44·8	40·8	44·6	44·1	44·3	41·9	36·7

Such inherent soil variations indicate the difficulties likely to be encountered in attempting to assess the effects on soil conditions brought about by differential watering when only single bays for each treatment are available. While this question of soil variability has been kept prominent in all the following discussions, the influence of factor (*b*) above, namely the growth of lucerne under irrigation prior to establishment of the pastures, is of such a character that it need not be specially considered except in one or two instances.

Effect of Irrigation on Physical Constitution of Soil.

In Table II mechanical analyses of samples, taken in 1914 from a point (C, Fig 1) in what was later the bay given four waterings of 6 inches for pasture, are compared with those for corresponding samples taken from a point about 6 feet distant in the same bay in 1935. The indications are that during the varied history of this area in the intervening years, the fine sand fraction has tended to increase and the clay fraction to diminish, not only in the surface soil, but also from 6 to 24 inches.

Whether this effect has any significance in relation to the irrigation tests on pasture may be examined by comparing samples from the "No Irrigation" bay with those from adjoining bays, as in Table III for Line A, and Table IV for Line B. Variations in fine sand content will not be considered further, as they appear to be dependent mainly on the variations in clay content. It is noted that there is consistent evidence of loss of clay from the surface soil as the result of irrigation, the magnitude of the loss being roughly 14 per cent. of the clay present in the "No Irrigation" samples

While it is not possible to trace any consistent effect on the clay content of the soils below the surface, conditions in this area are such that the bulk of the clay lost from the surface soil of irrigated plots as the result of irrigation

TABLE II.—COMPARISON OF MECHANICAL ANALYSES AND OTHER DATA FOR SOIL SAMPLES TAKEN IN 1914 & 1935.*

—	0–6 Inches.		6–24 Inches.	
	1914.	1935.	1914.	1935.
Gravel and rubble ..	0·9	..	4·3	6·7
Coarse sand ..	5·0	4·4	5·4	4·4
Fine sand	40·6	44·6	25·1	32·3
Silt	26·2	27·8	23·5	23·6
Clay	25·3	20·4	41·9	38·3
Loss on acid treatment	0·8	0·8	0·9	0·8
Moisture	1·7	1·0	3·5	2·3
Clay—				
0·002–0·001 mm.	4·6	4·5	5·8	3·2
<0·001 mm. ..	20·7	15·9	36·1	35·1
Loss on ignition ..	4·0	4·7	5·8	5·5
Calcium carbonate ..	0 023	0·005	0·003	0·000
Reaction pH ..	5·9	6·3	7 0	6·9
Total soluble salts ..	90	39	53	49
Chloride (as NaCl) ..	21	6	15	12

TABLE III.—MECHANICAL ANALYSES AND OTHER DATA FOR UNIRRIGATED BAY AND ADJACENT BAYS.—LINE A.

Irrigation Treatment—Waterings per Annum ..	Six of 6 inches.							No Water.						Five of 6 inches.					
Depth (inches) ..	0–6	6–9	9–14	14–20	20–33	33–48	48–66	0–7	7–12	12–20	20–33	33–47	47–66	0–6	6–11	11–16	16–23	23–33	33–5'
Gravel and rubble	..	0·2	1·5	..	0·2	..	1·1	0·1	0·1	5·9	..	..	1·4	..	..	..	5·8	..	11·2
Coarse sand ..	5·9	5·7	2·6	4·7	2·7	2·0	37·2	4·4	2·1	6·4	2·3	1·3	37·2	4·8	4·4	2·1	5·1	5·9	2·5
Fine sand ..	44·7	41·4	23·2	30·8	39·8	47·3		43·0	30·4	29·6	35·0	34·2		44·6	40·0	26·6	26·7	23·4	38·1
Silt	25·9	26·8	16·4	18·4	15·3	21·2	..	26·0	22·4	23·4	17·0	16·6	..	27·7	26·6	21·6	26·6	23·9	20·5
Clay	19·1	24·8	55·5	44·9	38·3	27·8	..	22·1	42·3	38·8	42·6	44·4	..	20·0	26·4	46·0	36·6	43·5	36·2
Loss on acid treatment ..	0·8	0·6	1·2	1·0	1·0	1·1	..	0·4	0·7	0·7	0·9	1·6	..	0·4	0·5	0·9	1·3	1·4	1·7
Moisture ..	0·9	1·0	3·2	2·7	3·2	2·5	..	1·0	2·1	1·9	3·2	4·0	..	1·5	1·0	2·2	2·2	3·5	3·0
Clay—																			
0·002–0·001 mm.	4·7	4·2	3·7	2·7	3·1	3·0	..	5·5	4·9	4·9	3·5	3·5	..	5·6	6·1	5·3	10·3	2·8	2·7
0·001–0·0002 mm. ..	8·7	10·2	13·3	9·8	11·5	7·8	..	9·5	13·2	10·9	12·9	14·2	..	8·1	10·8	13·0	6·7	11·8	10·9
<0·0002 mm.	5·7	10·4	38·5	32·4	23·7	17·0	..	7·1	24·2	23·0	26·2	26·7	..	6·3	9·5	27·7	19·6	28·9	22·6
Loss on ignition	4·6	3·9	7·2	5·8	4·6	3·6	..	4·5	5·6	5·5	4·9	4·7	..	4·8	3·9	6·1	5·3	5·9	4·6
Calcium carbonate	0·009	0·009	0·017	0·013	0·145	0·058	..	0·009	0·000	0·013	0·062	0·048	..	0·024	0·025	0·006	0·023	0·319	0·40
Reaction pH ..	7·0	7·2	6·8	6·7	8·1	8·5	8·8	7·0	6·2	6·2	8·3	8·7	8·8	6·8	7·0	6·5	6·8	8·5	8·8
Total soluble salts	41	33	43	51	60	28	90	34	30	43	59	75	130	44	33	42	60	67	75
Chlorides (as NaCl)	6	5	12	15	15	15	13	6	10	10	13	23	38	8	8	10	15	15	16

*In Tables II, III, IV, XIII, and XIV figures represent percentages of fine earth, with the exceptions of gravel and rubble (percentages of field samples), reaction (pH), and total soluble salts and chlorides (parts per 100,000).

TABLE IV.—MECHANICAL ANALYSES AND OTHER DATA FOR UNIRRIGATED BAY AND BAY GIVEN SIX WATERINGS OF SIX INCHES ANNUALLY.—LINE B.

——	No Water.							Six of 6 inches.							
Depth (inches) ..	0–7	7–12	12–19	19–33	33–49	49–80	80–108	0–7	7–14	14–20	20–32	32–42	42–53	53–84	84–140	140–161
Gravel and rubble	..	..	..	2·0	..	1·0	0·1	..	1·5	..	2·2	..	1·0	0·5	0·2	0·5
Coarse sand ..	4·3	2·3	5·0	4·2	4·1	1·9	1·2	4·6	1·3	2·8	3·3	2·6	2·2	1·5	0·7	0·6
Fine sand ..	40·1	22·6	27·2	41·6	52·7	27·9	17·8	42·4	22·9	27·9	41·8	44·8	38·9	23·2	17·2	13·1
Silt	25·7	15·9	16·9	18·4	20·9	18·9	15·1	26·2	15·3	18·9	20·8	17·9	18·7	14·3	17·3	17·6
Clay	26·4	55·6	46·3	31·5	20·8	43·1	54·6	21·8	54·8	47·3	31·1	31·6	36·5	40·6	54·5	58·9
Loss on acid treatment	1·1	1·3	1·0	3·5	1·2	6·0	7·2	1·0	1·2	1·3	1·9	1·4	1·6	15·7	4·6	2·3
Moisture ..	1·6	4·4	4·3	2·3	2·0	5·2	7·2	1·2	3·8	3·8	2·1	3·6	4·6	5·2	6·5	7·5
Clay—																
0·002–0·001 mm.	4·9	3·6	3·3	3·8	3·0	2·3	0·7	2·3	3·5	2·9	4·7	4·1	2·1	4·4	1·8	1·3
<0·001 mm. ..	21·5	52·0	43·0	27·7	17·8	40·8	53·9	19·5	51·3	44·4	26·5	27·5	34·4	36·2	52·7	57·6
Loss on ignition	5·0	7·2	6·2	5·0	3·7	6·1	7·2	4·3	7·4	7·4	4·5	4·1	4·2	10·3	6·2	5·5
Calcium carbonate	0·070	0·028	0·022	2·18	0·086	3·38	4·49	0·018	0·078	0·024	0·842	0·060	0·179	12·8	2·85	0·218
Reaction pH ..	7·8	7·5	7·6	8·9	8·8	9·1	8·9	7·8	7·4	7·9	8·6	8·7	8·9	9·0	9·2	9·1
Total soluble salts	39	39	30	86	80	118	120	38	42	45	65	55	86	112	122	125
Chlorides (as NaCl)	5	5	10	15	23	40	58	6	10	10	16	12	20	18	13	18

must have been washed into the deeper horizons of the soil profile. The high amounts of clay already present in the sub-surface horizons, and their variability, make it impossible to trace the chief subsoil zone in which displaced clay accumulates, but the conclusion that there is, in fact, such a displacement, appears to be valid. This is held because of the consistent character of the differences found, and the considerations that none of the samples compared is separated by a distance of more than 33 feet from its control and that inherent soil variability is comparatively low in the surface horizon.

Examination of the percentages of finer clay constituents set out in Tables II to IV shows that, as between the 1914 and 1935 samples from C, which has had the treatment four irrigations of 6 inches while under pasture, the loss of clay from the surface soil is almost entirely in the finer clay fraction (<0.001 mm.). The remaining comparisions show that, while a similar effect holds for five irrigations of 6 inches, when watering is increased to six irrigations of 6 inches, there is appreciable loss also in the coarser clay (0.002 to 0.001 mm.).

The likely effect of downward washing of clay under irrigation is that it would tend to accumulate in the natural structure channels of the soil profile, thus tending to restrict penetration of irrigation water. Actually, the irrigation officers have noted a tendency in these plots towards increasing difficulty in getting the soil to "take" the required amounts of water. Obviously such an effect is likely to be more intense in the heavily watered than in the more lightly watered treatments.

Soil Nitrogen and Organic Matter.

The content of total nitrogen in the surface 6 inches of the soil at C (Fig. 1) in 1935 was 122 parts per 100,000 of dry soil, compared with the corresponding 1914 figure of 82. For seven samples taken in 1914 from an area of 15 acres incorporating the land now under investigation, corresponding figures ranged from 78 to 101, with a mean of 91. The indication is therefore that a notable rise in soil nitrogen occurred in the surface soil over the period 1914 to 1935.

Determinations of total nitrogen were carried out on all surface soils of each bay in January 1936. Two samples in each bay were taken on each of three lines, spaced at regular intervals throughout the length of the bay and placed on areas which had had no manurial treatment other than superphosphate at the rate of 2 cwt. per acre per annum on either lucerne or pasture experiments. Samples were analysed separately for total nitrogen and the results are summarized in Table V.

Application of Fisher's (5) analysis of variance to the data, with due reservations dependent on the design of the experiment, suggests that differential irrigation treatment on the pasture has led to significant differences in soil nitrogen. The standard error being 5.1 per cent., the soil of the treatments six of 4 inches and six of 5 inches contains significantly more nitrogen than that of other treatments except five of 6 inches and six of 3 inches. Six of 5 inches is significantly greater than all treatments except six of 4 inches and five of 6 inches. The outstanding features are the good position of the six of 4 inches and

TABLE V.—SOIL NITROGEN 0 IN. TO 6 IN.

Watering per Annum.	Six of 3 inches.	Six of 4 inches.	Six of 5 inches.	Six of 6 inches.	No Water.	Five of 6 inches.	Four of 6 inches.	Three of 6 inches.	Eight of 3 inches.	General Mean.
Mean of six determinations.—Parts per 100,000 ..	156	175	182	144	142	164	132	131	142	152·0
As percentage of General Mean	103	115	120	95	94	108	87	86	93	100

six of 5 inches treatments, the consistently low position of the infrequently watered bays four of 6 inches and three of 6 inches, and the general mean value of 152 parts per 100,000 for soil nitrogen.

Comparison of the latter with the average soil nitrogen for 0 to 6 inches in this locality in 1914 shows that an average increase of approximately 67 per cent. in soil nitrogen content has occurred in the intervening years. On the best treatment from this aspect, six of 5 inches, the increase is approximately 100 per cent. Part of the general increase since 1914 must be attributed to the growth of lucerne on this area for five years prior to pasture establishment, but the nature of the results in Table V suggests that a substantial portion must be associated with the growth of pasture. Changes of this order in soil nitrogen content under leguminous pasture swards are to be expected (6), although no records for irrigated pasture have been found. For irrigated lucerne stands averaging 24 years' duration, nitrogen accumulation of rather less magnitude has been recorded in arid soils of South Wyoming (7). The relations between soil nitrogen status and water incidence (natural rainfall and irrigation) are brought out in Fig. 4.

The usual relationship between soil nitrogen and moisture supply may be expressed by a curve of similar type to Mitscherlich's logarithmic curve with decreasing increments (16), at least for natural rainfall conditions and considering virgin and grassland soils over wide tracts of country. It is hardly permissible to draw curves with the few values available in Figure 4, but related points have been joined for the purpose of demonstration—the treatments receiving six waterings per annum form one series, while the second includes those receiving varying numbers per annum of waterings each of 6 inches.

The critical nature of water incidence in relation to nitrogen accumulation in the pre-

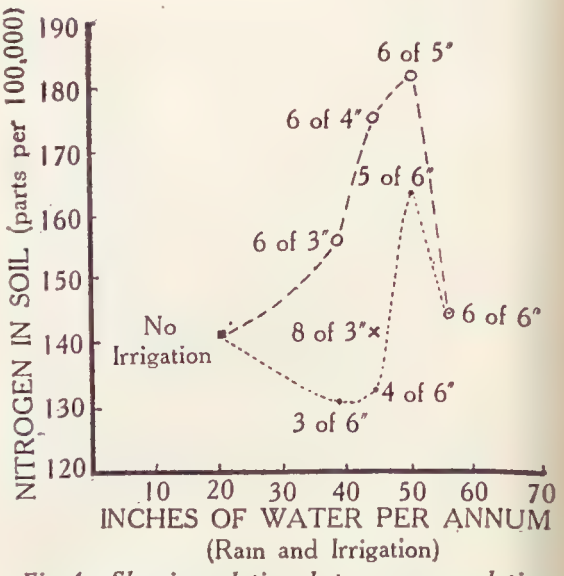


Fig. 4.—Showing relations between accumulation of soil nitrogen and water incidence (Rainfall and Irrigation).

sent instance is shown by the sharp fall with six waterings of 6 inches as compared with treatments receiving 30 inches of irrigation water annually.

It is of considerable interest to examine the relations between variations in soil nitrogen induced by differential waterings of pasture and the behaviour of the pastures themselves. The work of Jenny (16) led him to the suggestion that soil nitrogen and soil organic matter may stand in close relation to the amount of organic matter produced by vegetation. It might be expected that accumulation of nitrogen in the soil under the conditions of these experiments would be a function of yield, botanical composition of pasture, and proportion of bare space in the pasture. The latter is of importance in view of the well-known effect of bare ground in inhibiting accumulation of soil nitrogen or even promoting its

dissipation. With regard to botanical composition, from the aspect of a long-term effect such as nitrogen accumulation in the soil, it is probably the average composition of the pasture which is important. On this account, periodicities in growth of particular species in the various pasture treatments (1) are not considered in this connexion.

In Table VI, the irrigation treatments are listed in descending order of nitrogen accumulation in the soil and, within that order, are arranged in pairs. Data (1) on the factors above mentioned and on average protein percentage in the pastures (9) are given also.

In the tabulation, yields are given as averages calculated from the production figures given in (2) for the three seasons 1929 to 1931. Figures for pasture composition, from the same source, are comparable throughout from treatment to treatment, but are not given on a basis which gives a sum of 100 per cent. for each particular treatment.

With regard to yield, it will be observed that arrangement of the treatments according to soil nitrogen status gives also a pairing of treatments according to yield, with the exception of the infrequently watered treatments four of 6 inches and three of 6 inches. The latter however, are obviouslv closely related with respect to bare space and botanical composition, the dominance of subterranean clover being the outstanding feature in their constitution. On the whole, the arrangements in Table VI gives a fairly consistent assembly of the irrigation treatments in relation to the factors under review.

From the practical standpoint, the most important consideration is that of the treatment six of 4 inches. This treatment has been selected by the pasture investigators as the best among those tried—"In this plot we have a happy combination of yielding ability, persistence of desirable species, and outstanding nutritive value, together with a distribution of the annual production which approaches as closely as possible under Werribee conditions the ideal" (1). Table VI shows that this treatment, with the treatment six of 5 inches, which produces similar results at greater water cost, is outstanding in its effect on accumulation of soil nitrogen in addition to its virtues in herbage production.

It is evident from the table, however, that effect on soil nitrogen cannot be deduced directly from production capacities of the various treatments. The indications are that, as compared with the optimum six of 4 inches and six of 5 inches, frequent (i.e. more than four) waterings indiviually too heavy (6 inches), or individually too light (3 inches) produce systematic changes in pasture properties and soil nitrogen accumulation. The heaviest watering (six of 6 inches) and the most frequent (eight of 3 inches) produce pasture of average botanical and chemical composition fairly similar to that of the optimum treatments, but at lower production level and with less nitrogen accumulation in the soil.

Under less generous irrigation, the treatments five of 6 inches and six of 3 inches produce on the average pasture with notably less white clover and more cocksfoot than in the optimum treatments, the diminished clover/grass ratio being manifested in lowered percentage of protein in the herbage, especially in the more lightly watered treatment. In spite of

TABLE VI.—ACCUMULATION OF SOIL NITROGEN IN RELATION TO YIELD AND CHARACTER OF IRRIGATED PASTURE.

Irrigation per Annum.	Soil Nitrogen Parts per 100,000.	Yield lb./ac. Dry Matter.	Protein Percentage in Dry Herbage.	Pasture Composition Percentage.				
				Bare Space.	White Clover.	Subterranean Clover.	Ryegrass.	Cocksfoot.
Six of 5 inches ..	182	8988	24·6	6	56	17	6	17
Six of 4 inches ..	175	9275	24·8	5	61	11	5	19
Five of 6 inches ..	164	7641	23·7	13	45	19	8	22
Six of 3 inches ..	156	7453	22·5	15	38	14	8	27
Six of 6 inches ..	144	8338	23·9	6	65	9	11	14
Eight of 3 inches ..	142	8107	24·7	8	63	11	8	15
Four of 6 inches ..	132	8231	23·1	17	28	31	9	19
Three of 6 inches ..	131	7430	23·7	16	25	33	9	17

high proportions of bare space, low yield and low clover proportion, this pair of treatments has accumulated more soil nitrogen than the treatments six of 6 inches and eight of 3 inches. The infrequently watered bays four of 6 inches and three of 6 inches are of course in a class by themselves with regard to botanical composition, highest proportions of bare space and lowest accumulations of soil organic matter. The increased yield of the four of 6 inches treatment as compared with three of 6 inches is associated with diminished protein content of the herbage.

The considerable diminution in nitrogen accumulation in the soil of the six of 6 inches treatment as compared with six of 5 inches or five of 6 inches (Fig. 4) is noteworthy in view of the more usual effect that ample moisture supply favours nitrogen accretion. As it is possible that this low result may be due in part to leaching of nitrogenous material below the surface horizon, analyses to test this point were carried out.

TABLE VII.—NITROGEN IN SUBSOILS.

(Parts per 100,000 of dry soil.)

Six Irrigations of 6 inches.		No Irrigation.	
Depth (inches).	Nitrogen.	Depth (inches).	Nitrogen.
7–14	67	7–12	72
14–20	52	12–19	62

The figures recorded in Table VII do not lend any support to the idea of leaching of organic matter under heavy watering. The comparatively low nitrogen accumulation in the soil under six of 6 inches irrigation treatment is rather surprising in view of its content of white clover, the highest among the various treatments.

Relation of Soil Nitrogen Content to Texture.—For soils in general, there is a definite relation between nitrogen content and texture, heavier soils being inherently likely to contain more nitrogen than lighter soils. On this account, any consideration of differences in nitrogen status should include allowance for the texture factor. Data for mechanical composition of the surface soils in the present enquiry, listed in the Tables XIII and XIV and in Tables II and III, show that texture variations to a depth of 6 inches need not be considered in this connexion, except possibly for the "No Irrigation" bays, which tend to heavier texture than the watered bays. As this treatment has not entered largely into the above discussion, this question need not be considered further.

Effect of Accumulated Soil Nitrogen.—Nitrogenous organic matter accumulated under conditions such as those in the irrigated pasture experiment usually has a high degree of availability. On this basis, the optimum irrigation treatments for pasture, in addition to producing the most satisfactory results in quantity and quality of herbage over a period of years, have established soil conditions most favourable to maintenance of their superiority. This might be expected to be reflected in a kind of "residual" effect from the differential watering treatment. Actually, in one year in which the schedule of irrigations could not be completed because of rain, the yield of pasture followed the normal relations between the different watering treatments (2). Possibly this was due partly to an effect of the kind mentioned, in association with differences in pasture composition.

If availability of the accumulated nitrogenous organic matter is an important feature, its effect might be manifested in differential responses to nitrogenous fertilizer. During two seasons, 1932-33, 1934-35 (10) replicated fertilizer treatments were superimposed on the watering tests. Figures calculated from the results are given in Table VIII.

TABLE VIII.—RESPONSES OF IRRIGATED PASTURE TO SULPHATE OF AMMONIA IN RELATION TO PASTURE COMPOSITION AND SOIL NITROGEN.

Irrigation Treatment. Waterings per Annum.	Soil Nitrogen 0–6 in. Parts per 100,000.	White Clover in Pasture.	Protein in Dry Herbage.	Percentage Increase in Yield Due to Sulphate of Ammonia.
		%	%	
Six of 5 in. ..	182	56	24·8	2·8
Six of 4 in. ..	175	61	24·6	2·4
Five of 6 in. ..	164	45	23·7	3·5
Six of 3 in. ..	156	38	22·5	6·8
Six of 6 in. ..	144	65	23·9	0·8
Eight of 3 in.	142	63	24·7	1·9
Four of 6 in.	132	28	23·1	6·9
Three of 6 in.	131	25	23·7	7·6

"Percentage increase due to sulphate of ammonia" signifies percentage increase due to three dressings each at the rate of 1 cwt. sulphate of ammonia per acre in addition to

superphosphate 2 cwt. per acre, as compared with the phosphatic application alone. The results are calculated from averages for the two seasons mentioned.

The table shows that the optimum irrigation treatments six of 4 inches and six of 5 inches, with greatest accumulation of soil nitrogen, are among the treatments giving least response to nitrogenous fertilizer, while the infrequently watered treatments four of 6 inches and three of 6 inches, with least soil nitrogen give greatest response. The remaining treatments however, do not show consistent effects in this connexion. Probably the dominant effect is the well-known depressive influence of sulphate of ammonia on clover growth, the responses to nitrogen through the whole series showing strong negative correlation with proportions of white clover in the normal pasture. The comparatively large response to nitrogen shown by the "six of 3 inches" treatment, in conjunction with the low protein content of the normal herbage, suggests that the nitrogen regime in this treatment is somewhat abnormal, the pasture showing signs of dearth of nitrogen although nitrogen accumulation in the soil has proceeded to moderately good extent.

Soil Nitrogen and Total Organic Matter.—The average content of total organic matter in the surface 6 inches of soil in this area, calculated from determinations of organic carbon, is now approximately 2.3 per cent., compared with 1.2 per cent. for seven samples taken in 1914. On the basis of the nitrogen results, most of this increase may be attributed to the growth of pasture. The ratio of carbon to nitrogen in these soils is rather low, being approximately 8.7 : 1 for nine samples taken in 1936.

Soil Potash.

Table IX shows results for "available" potash in surface soil samples as determined by solubility in 1 per cent. citric acid (Dyer's method), and for "replaceable" potash by the Hissink procedure (11).

It is obvious from the table that there has been very notable diminution in available potash between 1914 and 1935 (at C) and that the four comparisons which may be made between "No Irrigation" and irrigated treatments immediately adjoining it, agree in demonstrating very marked decrease in available potash in the irrigated plots. The loss of available potash from the treatments six of 6 inches and six of 5 inches is of the order of 80 per cent. of that present in the "No Irrigation" plot. The case is strengthened by the finding of the low values shown in Table IX for available potash in the "six of 3 inch" and "six of 4 inch" bays.

Replacable potash determinations for the whole range of irrigation treatments, as shown for Line A, confirm the general situation of definite diminution attributable to irrigation and its effect on pasture growth. None of the values for irrigated plots is more than half that found for the "No Irrigation" bay.

The question of influence of treatment on replaceable potash content below the surface soil has been examined for the "No Irrigation" and the two flanking irrigated treatments. The results are shown in Table X.

It is noted that considerable depletion of replaceable potash has occurred in the clay subsoils as well as in the surface soil. Weighted averages to 20 inches are 22 for the treatment

TABLE IX.—AVAILABLE AND REPLACEABLE POTASH IN IRRIGATED PASTURE SOILS.
(Potash as K_2O, parts per 100,000 of dry soil.)

	Irrigation Treatment per Annum.								
	Six of 3 inches.	Six of 4 inches.	Six of 5 inches.	Six of 6 inches.	No Irrigation.	Five of 6 inches.	Four of 6 inches.	Three of 6 inches.	Eight of 3 inches.
Line A.—									
Available K_2O	8	12	..	7	36	6	..	..	..
Replaceable K_2O	16	8	20	17	40	6	16	16	16
1914 Available K_2O ..	..	..	..	..	..	..	25	..	..
C.									
1935 Available K_2O ..	..	..	..	..	..	..	8	..	..
Line B—									
Available K_2O	8	14	..	9	29	7	..	..	..

TABLE X.—DISTRIBUTION OF REPLACEABLE POTASH AND CLAY WITH DEPTH.

(Potash as K_2O, parts per 100,000 of dry soil.)

——	Six Irrigations of 6 inches.				No Irrigation.			Five Irrigations of 6 inches.		
Depth (inches) ..	0–6	6–9	9–14	14–20	0–7	7–12	12–20	0–6	6–11	11–16
Replaceable K_2O ..	17	8	28	28	40	50	28	6	6	12
Clay (per cent.) ..	19·1	24·8	55·5	44·9	22·1	42·3	38·8	20·0	26·4	46·0

given six irrigations of 6 inches, as compared with 38 for "No Irrigation", the difference being equivalent to approximately 1 ton of sulphate of potash per acre. While it is rather difficult to estimate the likely loss of potash from these plots in the form of produce removed during the pasture experiment, the preparation of such estimates leads to the suggestion that part of the loss of potash from the more heavily watered treatments is due to leaching of potash from the upper soil zones in drainage waters percolating to the subsoils. Part of this loss may be attributed to the downward washing of clay discussed in an earlier section, clay of course carrying potash as a constituent.

The more important point is the low levels of available and replaceable potash to which the surface soils of the irrigation treatments have been reduced. For dry pasture conditions, figures below 20 parts per 100,000 for potash in these forms often indicates likelihood of deficiency in potash supply, sufficient to engender response to application of potash. For irrigated pasture, conditions are probably different, in that an ample moisture supply assures a higher degree of availability to the plant of such potash reserves as are present in the soil than is the case under dry conditions. Although potash has not shown any promise in fertilizer trials on irrigated pasture in an adjoining field, further inquiry into this question by means of replicated tests has been initiated at the Research Farm.

Total potash, and, in general, replaceable potash, are related to clay content, so that figures for clay percentages have been reproduced in Table X. For the comparison between six irrigations of 6 inches and "No Irrigation", weighted averages for clay content to 20 inches are 36.8 per cent. against 33.8 per cent. so that inherently the former treatment might be expected to contain more potash than the latter. Expression of the results as milli-equivalents of replaceable potash per 100 gm. of international clay fraction gives a good idea of the low replaceable potash status to which the heavily irrigated soils have been brought. On this basis, values as low as 0.48 (for five irrigations of 6 inches, depth 6 inches to 11 inches) have been calculated from the figures of Table X.

While the values for replaceable and available potash for any particular treatment listed in Table IX are not always consistent in magnitude, not an unusual effect, the treatment given five irrigations of 6 inches shows consistently very low results throughout, both in surface soils and subsoils. There is no obvious reason for this, as this treatment is neither as productive nor as heavily watered as some of the others and the pasture carried on it is not of unusual composition either botanically or with respect to content of soluble ash (9). Further reference to this effect in this particular treatment will be made later.

Soil Phosphate.

One of the outstanding results from the work on irrigated pastures at the Werribee Research Farm has been the striking influence of superphosphate on production and character of the herbage. The limit of profitable application of superphosphate has not been reached with 4 cwt. per acre per annum (12).

The position is so clear as the result of the field experiments that there is no particular need to investigate the matter deeply from the soil aspect, except to specify the character of the soil at the site with regard to phosphate content. Analyses on samples taken in 1914 from the area including these plots showed that the soil has naturally a low and uniform phosphate content over the upper two feet of soil. Averages from seven surface soils, 0 to 6 inches and for the corresponding subsoils, 6 to 24 inches, are both 61 parts of P_2O_5 per 100,000

of soil. The range for the surface soils is 48 to 81 and for the subsoils 49 to 81 parts. Samples taken in 1935 show 66 parts of P_2O_5 per 100,000 for the surface soil of the treatment six irrigations of 6 inches and the rather higher value, as expected in view of the low production and phosphate applications equal to the other plots, of 76 parts for the "No Irrigation" bay.

The indications are that, for the higher-yielding irrigated treatments at least, there is no prospect of building up an appreciable phosphate reserve in the soil with annual applications of 2 cwt. superphosphate per acre under the conditions of these experiments. During certain of the years in which the herbage was completely removed from the plots after mowing, there was actually a slight drain on the phosphate reserves of the soil of the high-yielding bays. This follows from the removal annually of herbage cuts of the order 8000 to 9000 lb. per acre of dry matter, averaging about 0.75 per cent. P_2O_5, a phosphate removal of 60 to 68 lb. P_2O_5 per acre, as compared with approximately 50 lb. P_2O_5 applied annually in the form of 2 cwt. of superphosphate of P_2O_5 content 22 per cent. It is of interest to record here that ten surface soils taken in 1931 from the adjoining Rate and Frequency of Watering Tests on lucerne gave an average figure of 72 parts P_2O_5 per 100,000 of soil for the surface 9 inches.

The responses of the various treatments to superphosphate additional to the basal dressing of 2 cwt. per acre were tested during the two years in which fertilizer tests were superimposed on the watering tests, as noted above in connexion with sulphate of ammonia. The additional phosphate was also at the rate of 2 cwt. per acre. Calculations from the results (10) show that the weighted average response for all treatments from the extra superphosphate was 7.3 per cent. for the two seasons. The treatment five irrigations of 6 inches showed very low percentage responses in both seasons, averaging 3.9 per cent. compared with all other bays receiving four or more irrigations per season, which averaged 8.2 per cent. It is possible that this effect is associated with the very low levels to which available and replaceable potash had been reduced in this particular treatment.

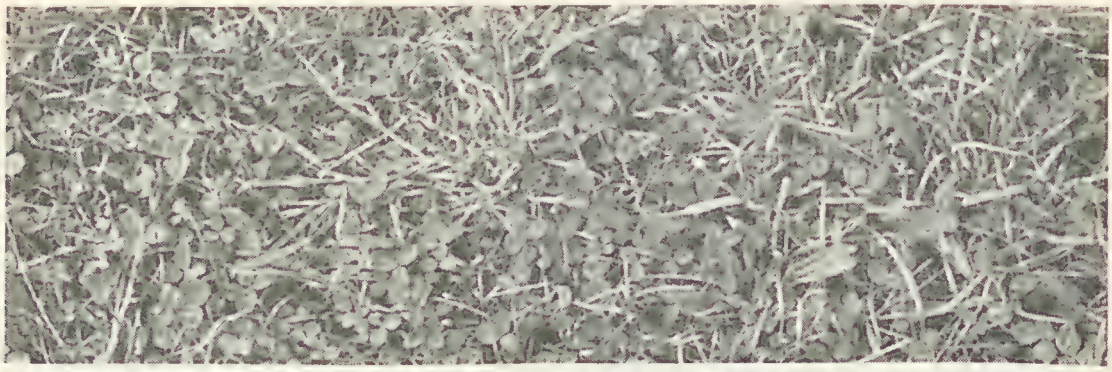
Replaceable Bases.

Replaceable potash in these soils has been discussed already. In Table XI are collected analyses for replaceable bases (Hissink method) for upper horizons of the various treatments.

The usual type of relation between replaceable bases in Victorian soils is observed in this table—calcium and magnesium the most important in the surface horizons, with the relative importance of magnesium increasing with depth to become dominant below 12 inches. Replaceable sodium does not exceed moderate proportions in horizons down to 20 inches, although from general indications it

TABLE XI.—REPLACEABLE BASES IN SOILS.

Irrigation Treatment.	Depth (inch).	pH	Total Bases. (Milli-Equivalents per 100 gm.).	Percentage of Total Bases.			
				Ca.	Mg.	Na.	K.
Six of 3 inches	0–6	7·1	9·8	52	36	9	3
Six of 4 inches	0–6	7·3	9·7	50	34	14	2
Six of 5 inches	0–7	6·8	10·3	56	34	6	4
Six of 6 inches	0–6	7·0	10·4	46	40	11	3
Six of 6 inches	6–9	7·2	9·0	48	35	15	2
Six of 6 inches	9–14	6·8	14·8	37	53	6	4
Six of 6 inches	14–20	6·7	14·7	23	59	14	4
No Irrigation	0–7	7·0	8·8	49	28	13	10
No Irrigation	7–12	6·2	10·4	45	34	11	10
No Irrigation	12–20	6·2	9·6	24	59	10	6
Five of 6 inches ..	0–6	6·8	7·1	51	44	3	2
Five of 6 inches ..	6–11	7·0	8·5	50	39	9	2
Five of 6 inches ..	11–16	6·5	11·3	41	44	13	2
Four of 6 inches ..	0–6	6·8	7·4	48	40	7	5
Three of 6 inches ..	0–6	7·1	7·8	54	34	7	4
Eight of 3 inches ..	0–6	6·6	9·0	47	35	14	4



White clover is an important constituent of irrigated pasture at Werribee.

probably reaches high values in the deeper subsoils. The fact that surface soils may contain as much as 14 per cent. of their replaceable bases as sodium, indicates however that this soil type is a somewhat salinized variety of red-brown earth. Piper (17) gives an average figure of 4 per cent. for the red-brown earths of South Australia.

Low values for total bases are found in the unsaturated horizons of the upper subsoil, the figures ranging down to 24.6 milli-equivalents of total replaceable base per 100 gm. of international clay fraction. It is possibly of some significance in connexion with water penetration that the southern bays contain more replaceable lime than those to the north. An average for surface soils of the four southern irrigated bays is 144 parts per 100,000 for replaceable lime as CaO, compared with 120 for the unirrigated treatment and 107 for the four northern bays. The treatment six of 5 inches is outstanding with a figure of 162 parts; it has been noted (1) that this bay showed certain abnormalities in botanical composition.

Soil Reaction.

Examination of the reaction pH values (determined by the quinhydrone-electrode), set out for these soils in Tables II-IV, XIII-XIV, shows that, while the upper horizons do not usually depart notably from neutrality, high reactions are characteristic of the deeper subsoils. Reaction rises sharply above pH 8.0 at about 24 inches depth, with the advent of appreciable amounts of calcium carbonate. Below this depth, values of the order of pH 9.0 are common, soluble carbonate being noted in these deeper horizons. In the zones between the surface soil and 24 inches, unsaturated soils with reactions of the order 6.4 to 6.8 are usually found.

A comparison is available between Line B, which received three annual dressings of lime at the rate of 1 ton per acre during the period of lucerne experiments (1919 to 1924), and Line A, which has not received lime dressings subsequent to that of quicklime (1 ton per acre) given to the whole field in 1912. This comparison shows that the effects of the liming along Line B may be traced down to the zone 24 to 30 inches, as indicated by generally higher reaction as compared with Line A. The zone 12 to 18 inches is now showing the greatest effect on reaction, due to this liming, a typical figure for Line B being 7.6 compared with 6.5 for Line A, while the corresponding figures for the surface soil are 7.3 and 6.8. Contents of calcium carbonate, though small throughout the upper horizons (Table II to IV) are appreciably greater in general on Line B than on Line A. The information available does not enable a decision to be made as to the influence of the difference in base status between these two strips on productivity of irrigated pasture. Manurial tests on an adjoining site do not show any increases in yield as the result of the use on irrigated pasture in this locality of lime or gypsum in addition to superphosphate.

No consistent relation has been observed between reaction, or content of calcium carbonate, and irrigation treatment on these plots. It is evident that, prior to liming in 1912, the upper horizons would all have shown slightly acid reactions, including the surface soils.

Soluble Salts.

Figures for total soluble salts and sodium chloride listed in Tables II-IV, XIII-XIV are of comparatively small magnitude throughout. No consistent differences between the various irrigated treatments have been noted with respect to sodium chloride content, but there is a definite difference between the "No Irrigation" and the adjoining irrigated bays in the content of sodium chloride in the soil below 33 inches. With increasing depth this effect is intensified, the greatest difference being found at the maximum depth studied, approximately 9 feet. Weighted averages for sodium chloride content from the surface to 9 feet are 33 parts per 100,000 of soil for the unirrigated bay as compared with 15 parts for the treatment six irrigations of 6 inches.

These differences are attributable to leaching of some of the salt from the soil of the irrigated bays by the penetration of irrigation water, a normal consequence of irrigation. The loss of salt favours deflocculation and hydrolysis of the clay, giving highly alkaline reaction, both effects tending to decrease permeability. Although the content of salt even in the deeper horizons of the unirrigated bay is comparatively low, it is feasible that the lowered salt content in the deeper zones of the irrigated treatments has affected their permeability to some extent. Possibly this has contributed to the increased difficulty in obtaining water penetration into the irrigated bays.

Variations in total soluble salts do not provide such a clear indication of the course of leaching as chlorides, because bicarbonate and sometimes soluble carbonate content is increased following clay hydrolysis when other salts have been reduced to a low level. The relations between the soluble salt constituents are shown in Table XII.

TABLE XII.—SOLUBLE SALTS IN SOILS, (as parts per 100,000 of soil.)

Depth (inch).	Total Soluble Salts.	Chloride Cl.	Sulphate SO_4.	Carbonate CO_3.	Bi-Carbonate HCO_3.
20–32	65	9	11	..	49
32–42	55	6	14	..	18
34–49	80	15	20	..	40
80–108	120	16	17	11	52
0–6	90	16	10	..	8
6–12	25	4	4	..	8
6–12	50	6	5	..	8
11–16	60	9	8	..	5
47–66	130	24	15	..	71
48–66	90	10	8	2	73
37–47	75	8	9	..	49

Bicarbonate is the dominant anion in several of the soils listed, while sulphate is usually of similar order to chloride. Carbonate occurs in the deeper subsoils of high reaction, reflecting relatively unfavourable conditions involving clay hydrolysis as discussed above.

Free Water in the Soils.

In July, 1935, when no irrigation water had been applied to these plots for some months, levels of free water in the soil were very variable. No free water was found to a depth of 16 feet in the middle sections of the "No Irrigation" bay. Corresponding sections of the "six waterings of 6 inches" bay showed very moist soil at about 4 feet 6 inches, associated with the soil change from light textured material to the medium clay of the deeper subsoil. A bore continued to 14 feet in this bay showed ground water level at a depth of 7 feet 10 inches after two weeks. Middle sections of the "eight waterings of 3 inches" bay showed free water at 4 feet 6 inches, this bay having comparatively little slope and being imperfectly graded at the headland end. The lower (eastern) ends of all bays receiving six waterings annually showed ground-water levels at approximately 5 feet, corresponding sections of other bays having no free water to 7 feet, including the "eight waterings of 3 inches" bay which has a reasonable slope on the lower half.

From these and other observations it appeared that, as expected, the subsoil of the unwatered bay was free from excess water and that those of the irrigated bays contained free water at varying depths from 4 feet downwards, depending on the intensity of irrigation and local topography. Penetration of water through the clays of the deep subsoil is very sluggish and there is very little lateral soakage below 4 feet.

In January, 1936, all bays, including the former "No Irrigation" treatment, were given an irrigation of approximately 3 inches in two applications and the rate of fall of the free water surface in the soil was followed by means of test-wells. At 48 hours after cessation of irrigation, the readings confirmed the readier penetration of water into the southern bays. The shallowest water level found in the three

southernmost bays at that time was 2 ft. 10 in., compared with figures ranging from 0 to 5 inches for the next five bays and 14 inches for the former "eight of 3 inches" bay.

Rates of fall during ensuing days naturally varied according to the level at 48 hours, since rate of movement through the deeper subsoils is usually slower than through the upper horizons. Thus rate of fall of water level in the northern bays was approximately 5 inches per day between two and eight days, while the three southern bays, which had given comparatively rapid initial penetration, showed rates of only about 2 inches per day during this time. The former "six waterings of 4 inches" bay gave particularly good penetration, having no free water above 6 feet after four days in the middle portions of the bay. The general effect after eight days was a fall of free water level at diminished rate, but by thirteen days after irrigation free soil-water was below 3 feet in all treatments, such a condition comparing favourably with certain irrigated soils of the north of the State which have lower clay content than these Werribee soils (13).

Samples for determination of soil moisture, taken before and after the irrigation mentioned, indicated that although there was free water only a few inches below the surface in both the former "No Irrigation" and "six of 6 inches" bays, some water had penetrated to the zone 18 to 36 inches in the first-mentioned bay, while no appreciable amounts had reached below 18 inches in the latter bay. Eight days after irrigation, water had penetrated below 36 inches in both cases. There is a suggestion from these results that heavy watering may have induced greater difficulty in water penetration into the upper horizons.

Expansion Properties of Soil Profile.

A pronounced effect on level of the soil surface was observed by the irrigation officers during the progress of these Rate & Frequency of Watering Tests on pasture, the "No Water" bay being lower than its irrigated neighbors. Levels taken in July 1935 showed that the surface of the unirrigated bay was approximately 0.17 foot lower than the mean level of the flanking bays. In April 1936, after all bays had been given uniform irrigation for a season, the former "No Water" bay had risen slightly as compared with the former "six of 6 inches" bay. In July 1937, after two seasons of uniform irrigation, the surface of the formerly unwatered bay showed a level 0.08 foot lower than the mean level of the two adjoining bays.

This effect on surface level is attributed to the expansion of the soil as the result of wetting by irrigation. Examination of the profile for expansion properties by means of the Keen-Raczkowski technique (14) showed that the expansion in volume when the soil was fully wetted varied from approximately 5 per cent. for the surface soil to 44 per cent. for the very deep subsoil at depths of the order of 12 feet. That irrigation water had penetrated to such depths under the heavier watering treatments is indicated by data on salt distribution and on free water in the soils.

Moister conditions in the subsoils of the irrigated plots are sufficient to account for the differences in level noted, particularly in view of the high expansion coefficients found for the deep subsoils. No evidence was obtained from volume-weight determinations on the upper horizons that the difference in level could be attributed partly to a more open structure in the irrigated plots as the result of increased root growth. As the irrigations given to all bays since 1935 have not been heavy, presumably there has been insufficient penetration of water to the deeper subsoil of the former "No Water" plot to bring it to a condition comparable with that in the neighbouring bays, although as noted above, the disparity in level had been reduced by half in two years.

It is of interest to note that a rise of 5 inches in soil surface, due to a summation of expansion effects at depths down to 5 feet, has been recorded following irrigation of the heavy difficultly permeable soil of the Sudan (15).

Relation to Soil Types in other Districts.

The description and analytical data given in this record provide a thorough definition of the type of soil at Werribee on which the Rate and Frequency of Watering Tests on pasture were conducted. It is a somewhat salinized variety of red-brown earth. An important point is the relation of this soil type to soils in other irrigation districts of the State.

In this respect, particular significance attaches to the "clay-pan" feature of the profile, i.e. the sudden transition within a foot from the surface to medium or heavy clay, and the occurrence deeper in the subsoil of a light textured zone showing pronounced sandy influence, followed by a deep heavy clay bed. Soils with these characters and many others in common such as similar colour of the various horizons, nature of occurrence of calcium carbonate &c., occur fairly widely in the north of the State in irrigation areas and have been described at Bamawm (4) and in the Goulburn Valley (3). Such soils are associated in the north of the State with both open plain and timbered country and have been found in considerable occurrences in the new Murray Valley irrigation districts in the vicinity of Cobram.

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TABLE XIII.—MECHANICAL ANALYSES AND OTHER DATA FOR SOIL PROFILES.

	Profile at C.							Line B.				
	Four Irrigations of 6 inches.							Six Irrigations of 4 inches.				
Depth (inches)	0–9	9–12	12–16	16–20	20–31	31–40	40–54	0–7	7–16	16–24	24–36	36–60
Gravel and rubble ..	..	..	0·1	..	0·2	0·7	0·2	..	..	..	..	..
Coarse sand	3·7	1·9	2·6	10·7	3·1	3·4	2·9	4·4	2·0	3·6	2·2	1·7
Fine sand	41·0	25·4	30·9	30·1	26·5	37·1	35·2	45·7	20·8	47·7	51·0	47·0
Silt	26·8	21·6	29·9	25·4	18·4	23·3	20·5	27·0	13·9	19·6	..	..
Clay	24·4	45·3	36·2	32·2	48·4	34·4	38·5	19·7	58·9	26·9	..	..
Loss on acid treatment ..	0·5	0·3	0·3	0·2	0·7	0·7	1·1	0·5	0·6	0·2	..	..
Moisture	1·6	3·2	2·4	2·7	4·6	3·2	4·0	1·3	5·1	2·1	..	..
Loss on ignition	4·4	5·9	4·5	4·6	5·9	4·0	4·2	4·2	7·5	3·5	..	..
Clay—												
0·002–0·001 mm. ..	4·3	2·6	3·9	4·7	2·2	3·0	2·2	4·0	0·7	1·8	..	..
<0·001 mm.	20·1	42·7	32·3	27·5	46·2	31·4	36·3	15·7	58·2	25·1	..	..
Calcium carbonate ..	0·006	0·000	0·000	0·011	0·012	0·197	0·458	0·112	0·003	0·000	0·026	0·104
Reaction pH	6·7	6·9	6·4	6·9	8·1	8·7	8·8	7·3	7·1	7·9	8·2	8·5
Total soluble salts ..	31	45	43	47	74	68	86	43	36	42	59	45
Chlorides (as NaCl) ..	3	6	8	16	20	21	12	5	6	10	15	12

Table XIV.—Partial Mechanical Analyses and Other Data for Soil Profiles.—Line A.

Irrigations per annum ..	Six of 3 inches						Six of 4 inches.					Six of 5 inches.			
Depth (inches)	0–6	6–10	10–17	17–25	25–37	37–47	0–6	6–11	11–16	16–31	31–43	0–7	7–14	14–29	29–48
Gravel and rubble ..	..	..	..	..	1·2	0·9	..	..	..	0·7	..	..	..	..	0·5
Total sand	49·5	46·5	27·5	40·4	41·5	52·0	50·1	44·1	28·8	48·1	55·3	48·9	31·2	38·0	47·6
Reaction pH	7·1	7·0	6·6	7·8	8·4	8·5	7·3	6·9	6·5	8·1	8·3	6·8	6·3	7·4	8·6
Total soluble salts ..	34	30	43	48	75	75	39	33	36	77	43	35	43	45	64
Chloride (as NaCl) ..	8	8	13	13	12	13	12	13	12	13	12	6	6	13	12

Irrigations per annum ..	Four of 6 inches.					Three of 6 inches.					Eight of 3 inches.				
Depth (inches)	0–6	6–12	12–21	21–33	33–48	0–6	6–12	12–21	21–35	35–47	0–6	6–11	11–23	23–31	31–43
Gravel and rubble ..	0·3	1·6	7·1	..	0·8	..	..	..	..	0·1	..	0·1	0·7	..	0·8
Total sand	52·9	51·0	32·9	32·7	44·2	53·4	50·1	22·2	46·7	50·9	50·6	46·7	27·3	42·5	47·3
Reaction pH	6·8	6·9	6·5	8·1	8·7	7·1	6·7	6·4	8·0	8·6	6·6	6·8	6·6	8·2	8·5
Total soluble salts ..	42	50	45	56	84	33	25	45	43	58	34	32	52	54	63
Chloride (as NaCl) ..	13	13	12	13	12	6..	8	10	13	13	10	10	16	16	16

Partial Mechanical Analyses and Other Data for Soil Profiles.—Line B.

Irrigations per annum ..	Six of 3 inches.							Six of 5 inches.					
Depth (inches)	0–8	8–12	12–19	19–31	31–48	48–54	54–60	0–7	7–14	14–24	24–36	36–45	45–60
Gravel and rubble ..	..	..	0·7	1·1	..	..	1·3	..	0·3	..	0·7	..	0·1
Coarse sand	4·2	2·5	3·1	7·9	3·9	2·4	3·6	5·4	2·9	5·9	4·3	1·7	1·6
Fine sand	47·4	35·0	33·2	39·7	53·8	49·1	38·4	45·8	26·2	29·9	54·9	43·7	36·2
Reaction pH	7·7	7·3	7·1	8·5	8·8	8·8	8·9	7·8	7·1	7·9	8·4	8·7	8·7
Calcium carbonate ..	0·04	0·00	0·00	0·20	0·02	0·05	0·02	0·06	0·01	0·01	0·07	0·17	0·09
Total soluble salts ..	41	39	45	66	67	66	74	38	46	61	50	75	71
Chlorides (as NaCl) ..	5	3	12	18	23	16	20	5	5	16	15	18	15

Irrigations per annum ..	Five of 6 inches.							Four of 6 inches.					
Depth (inches) ..	0–6	6–12	12–20	20–26	26–39	39–50	50–61	0–8	8–13	13–20	20–27	27–40	40–53	53–59
Gravel and rubble ..	0·1	..	0·9	1·2	..	..	2·5	0·3	0·8	..	0·8	..	..	..
Coarse sand	4·0	2·6	2·9	6·8	3·6	1·7	1·8	5·0	3·2	2·8	4·4	4·3	3·7	1·5
Fine sand	46·0	23·2	24·4	42·6	49·7	48·6	32·0	46·2	27·6	22·9	37·8	47·2	48·8	34·6
Reaction pH	7·3	7·5	7·6	8·8	8·9	9·0	9·0	7·0	7·3	7·8	8·6	8·7	8·7	8·7
Calcium carbonate ..	0·02	0·02	0·00	1·29	0·21	0·01	0·22	0·04	0·01	0·02	0·63	0·22	0·00	0·09
Total soluble salts ..	42	48	64	74	75	63	86	48	47	64	93	86	82	86
Chlorides (as NaCl) ..	3	8	16	20	16	15	16	5	6	20	26	33	35	26

Irrigations per annum ..	Three of 6 inches.							Eight of 3 inches.					
Depth (inches)	0–7	7–13	13–18	18–25	25–30	30–47	47–61	0–6	6–12	12–17	17–24	24–33	33–53
Gravel and rubble ..	0·4	..	..	15·9	..	..	0·4	..	..	0·3	2·1	1·1	0·6
Coarse sand	4·4	2·1	4·0	5·5	2·1	2·8	1·3	5·0	2·0	1·4	4·2	2·0	2·7
Fine sand	44·7	21·3	24·0	33·2	31·5	49·9	28·4	41·1	22·8	24·4	36·2	28·8	39·1
Reaction pH	7·4	7·3	8·1	8·9	8·8	9·0	8·9	7·1	6·9	7·1	8·6	8·9	8·9
Calcium carbonate ..	0·05	0·00	0·00	3·08	0·58	0·57	0·24	0·09	0·00	0·00	1·11	1·55	0·35
Total soluble salts ..	78	63	74	94	97	102	106	42	52	56	86	94	86
Chlorides (as NaCl) ..	21	12	15	35	30	26	33	5	13	12	23	25	26

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Oats for Grazing

Mallee Results

By H. J. Sims, B.Agr.Sc., Manager, Mallee Research Station, Walpeup

FOR many years Mallee farmers have appreciated the fact that sheep on their farms can be of material assistance in reducing the cost of production of wheat. The very low prices prevailing for this commodity generally since 1930 have resulted in an increasing number of farmers in the Mallee adopting a type of mixed farming in which more sheep are maintained on the farm. This practice is adopted not merely because of the value of sheep in controlling rubbish on fallows, thus reducing cultivation costs, but as a definite part of a planned arrangement, under which the sale of fat lambs and wool is of considerable financial importance.

The natural pastures which develop in the Mallee usually consist of annual species with a short growing period and with a low stock-carrying capacity. At the Mallee Research Station, at Walpeup, in recent years attention has been given to the development and establishment of better pasture species for the district, but considering the cost of sowing, the palatability of the seed produced, and the ability to recover after successive grazing, oats can be regarded as one of the most suitable plants to sow for green feed for sheep and lambs during the winter and spring months.

In 1935, experiments were commenced at the Mallee Research Station, Walpeup, with the object of determining the comparative suitability of oat varieties for grazing, for either portion or the whole of their growing period. When grazing is carried out over part of the growing period only, a comparison of the different varieties of oats to recover and produce grain is important. Other factors which influence the amount of feed produced, such as rate of seeding and manurial treatment, were also studied. The green feed produced by the varieties under test was determined by cutting and weighing samples, and the number of sheep carried on the various plots was also recorded.

The monthly rainfall during each of the years in which the tests were conducted and the average for the 28-year period 1912 to 1939 are as follow:—

Month.	1935.	1936.	1937.	1938.	1939.	Average 28 years.
January	34	274	165	125	13	63
February	2	5	18	49	343	91
March	71	26	135	0	12	79
April	89	120	6	81	222	77
May	59	108	68	2	135	128
June	114	66	192	36	183	132
July	118	256	71	167	87	115
August	72	94	223	51	150	135
September	106	11	48	6	47	138
October	173	161	275	8	37	140
November	14	24	19	9	146	90
December	47	100	124	2	3	97
April–October ..	731	816	883	351	861	865
Total ..	899	1,245	1,344	536	1,428	1,285

Grazing throughout Growing Period.

In order to compare the amounts of green stuff provided by the principal varieties of oats, three-acre plots of each variety were sown with a combine on stubble land usually

Sheep grazing on oat plots.

late in April, without manure, and the feed produced was fed-off by sheep. A third of each plot was grazed as a section and the sections grazed in rotation. Five varieties were sown in 1935 and 1936, but it was possible to include only three varieties in 1937. All the varieties were grazed simultaneously, the number of sheep used at each grazing being adjusted to the feed available. The dates and times of grazing varied with the seasonal conditions, but each plot was grazed four times from July to November in 1935 and 1937, and five times in 1936. The average results for the three years are presented in Table I., the figures representing the number of sheep-days per acre for the period July to November.

TABLE I.—SHEEP-DAYS OF GRAZING 1935, 1936 AND 1937.

Variety.	Type.	First Grazing.	Second Grazing.	Third Grazing.	Fourth Grazing.	Fifth Grazing (1936).	Total.
Mulga ..	Early ..	101	118	122	56	43	412
Dawn ..	Mid-season ..	97	142	140	80	55	487
Algerian ..	Late ..	77	121	137	91	57	445
1935 and 1936 only.							
Mulga ..	Early ..	129	92	109	58	43	409
Belar ..	Early ..	144	101	108	55	52	434
Dawn ..	Mid-season ..	119	111	139	98	55	494
Lachlan ..	Late ..	94	99	117	88	48	422
Algerian ..	Late ..	97	97	116	89	60	429

To show the amount of feed available throughout the grazing period, a graph (Fig. 1) has been prepared from data obtained by sampling. Samples were cut from the plots immediately before and after grazing by the sheep, and the amounts of green stuff eaten, expressed as hundredweights per acre, were obtained as the difference between the weights of samples cut before and those cut after grazing.

This graph, and the sheep-day records demonstrate very clearly that at the first grazing in July, most feed was provided by the early maturing types, Mulga and Belar. Dawn, the mid-season type, gave slightly lower yield at the first grazing but a much higher one at the August and September grazings. The late-maturing type Algerian, gave the greatest quantities of feed at the last grazing, as it responded best to the late spring rains. In a normal year, feed is of greatest value in winter, but green feed in November, after the native grasses have gone to seed, is very useful for late lambs. Considering the feed produced throughout the whole of the season, Dawn gave 10 per cent. more, and Mulga 6 per cent less than Algerian for the three years.

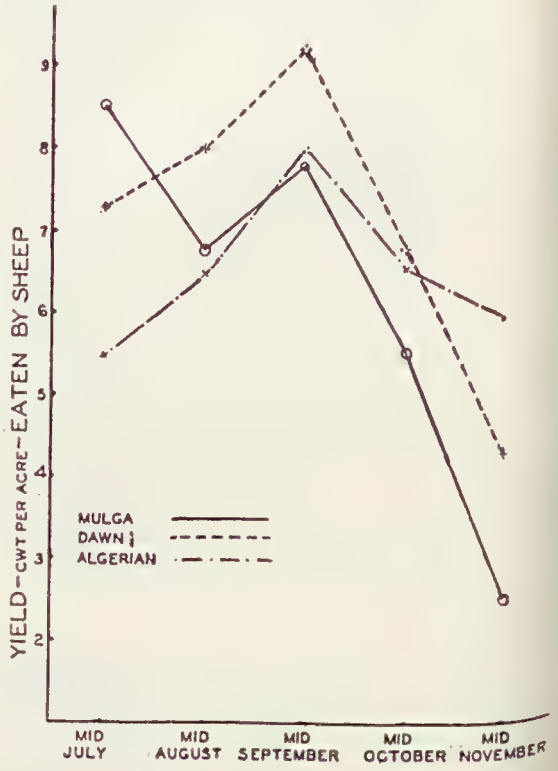


Fig. 1.—Showing amounts of green feed eaten by sheep during the growing season.

Oat variety plots at the Mallee Research Station.

At present, Algerian is the variety most commonly grown in the mallee for hay, grain, or grazing. The results of tests at Walpeup indicate that, in the Mallee, Algerian could be replaced with advantage by an earlier maturing variety on at least part of the area. The sowing of more than one variety is probably desirable. Mulga or Belar would provide early feed, and Algerian would provide late feed, but if it is desired to sow only one variety, then of all the varieties tested, Dawn has proved the most suitable.

Recovery after Grazing.

In many districts crops are grazed in the winter and then allowed to ripen normally. In the Mallee it is a common practice to treat oats in this manner. The nature of the season following the winter grazing of the crop usually determines the use to which it is put—whether it is cut for hay, stripped for grain or not harvested at all. It frequently happens that the crop after grazing does not reach sufficient height to enable it to be cut for hay.

In 1935, experiments were commenced at Walpeup to compare the ability of different oat varieties to recover and produce a crop after being grazed in the winter. In the first two years of the test each variety was grazed twice (July and August) but as this practice punished the plants too severely, the number of grazings in each of the three subsequent years was reduced to one. The amounts of green feed produced up to the time of grazing in July were also determined by detailed sampling, due attention being given to moisture variations as shown by analyses. The results of this work together with the yields of grazed and ungrazed plots are given in Table II.

Table II.—Recovery of Oats after Grazing.

Variety.	Average Weight Greenstuff, July, Three Years, 1937 to 1939.	Grain Yields, Average Five Years, 1935–39.		Grain Yields, Average Three Years, 1937–39.	
		Ungrazed.	Grazed once.	Ungrazed.	Grazed once.
	cwt. per acre.	bus./ac.	bus./ac.	bus./ac.	bus./ac.
Mulga x Palestine R6–1–1 ..	19·8	..	..	17·8	10·8
Mulga	18·7	20·2	11·4	21·6	11·0
Palestine x Dawn R4–1–1 ..	19·5	..	..	26·4	16·4
Gidgee	20·2	18·7	11·5	21·3	12·1
Burke	17·1	..	..	24·3	12·5
Early Kherson	17·2	..	..	24·8	11·0
Fulghum	19·7	..	..	21·9	16·4
Dawn	18·0	18·4	10·5	21·3	9·6
Guyra	19·1	19·3	11·6	24·3	10·7
Lachlan	18·3	18·4	10·5	22·6	10·1
Ideal	15·2	18·3	12·9	23·2	13·5
Palestine x Dawn R46–2–1 ..	17·8	..	..	24·9	12·5
Algeribee	18·4	..	..	21·6	10·6
Algerian	16·0	18·0	12·0	21·8	10·9

The varieties in Table II. are arranged in their normal order of maturity. It will be seen that the early and mid-season varieties have produced the greatest amounts of green feed at the grazing in July. Also that the subsequent grain yield of all varieties tested is seriously reduced by grazing. The varieties Palestine x Dawn R4-1-1, Fulghum, and Ideal show up to advantage in this direction. An examination of the yields obtained in individual years and the incidence of the rainfall shows the importance of the spring rains in determining the recovery after grazing. If good late rains are received, the later-maturing varieties recover much better than the early types, but in the absence of such rains the yield reductions as a result of feeding-off are just as great in the late as in the early varieties. In general, the early-maturing oats cannot be grazed as late as Algerian if equivalent hay or grain yields are desired.

A factor of importance in determining the recovery of oats after grazing is the habit of growth of the plant. There are two distinct phases in the growth of cereal plants, the grassy or rosette stage, and the upright or reproductive stage. Grazing a crop in the grassy stage does not affect the main stools, but this grazing should be discontinued when the plant begins upright or stemmy growth; with oats sown early in May this occurs about the end of July for early varieties at Walpeup, and about a month later for Algerian. It has been found that even among varieties that ripen at the same time, there are big differences in the length of the grassy stage. Fulghum and Dawn, if ungrazed, ripen at approximately the same time, but Fulghum commences upright growth nearly a fortnight later than Dawn. It has been found that the grain yield of Fulghum is less affected by grazing than that of Dawn. The varieties Palestine and Dawn R4-1-1 and Ideal also have a long grassy stage and a short post-jointing stage.

Rate of Seeding.

When an oat crop is being sown for the purpose of grazing to stock, much more feed is obtained if heavy rates of seeding are adopted. This is well illustrated by the figures in Table III. which gives the average weights of greenstuff in a test, extending over the two years 1935 and 1936.

TABLE III.—RATE OF SEEDING.

Variety.	Rate of Seeding.	July Grazing.	August Grazing.
	lb. per acre.	cwt. per acre.	cwt. per acre.
Mulga ..	30	4·9	6·9
„ ..	50	6·8	7·5
„ ..	70	8·7	9·3
Algerian ..	30	5·7	8·6
„ ..	50	6·4	10·0
„ ..	70	8·2	10·6

Showing difference in early growth of oats sown under the same conditions—left, Dawn; right, Algerian.

Mulga oats at Walpeup in September, 1939.

It will be seen that both varieties show an increase in the weights of green feed produced as the seeding rate is increased. This is more noticeable with Mulga than with Algerian. The former, like most early-maturing varieties, is a sparse-stooling type in comparison with Algerian. Counts of stools per plant, made prior to each grazing, showed that the plants under the lower-seeding rates stooled much better than those where heavier seeding was adopted. This was more evident in the case of Algerian than Mulga.

An important point when considering the rate of seeding, is the size of the grain. In this respect oats show more variation than most other cereals. The variation in grain size will be seen from Table IV., which shows the number of grains per pound, of the varieties sown under comparable conditions and harvested in 1937.

TABLE IV.—VARIATION IN GRAIN SIZE.

Variety.	Grains per lb.
Palestine x Dawn R4–1–1 ..	10,060
Mulga x Palestine R6–1–1 ..	11,045
Palestine x Dawn R46–2–1 ..	11,245
Guyra	11,490
Dawn	11,560
Lachlan	11,740
Gidgee	12,325
Mulga	12,535
Fulghum	13,835
Algeribee	14,370
Karcela	14,570
Algerian	14,625
Ideal	15,445
Early Kherson	17,725
Burke	18,705

The seasonal and soil conditions under which the crop is grown, will of course, affect the size of the grain produced. In the above test the grain of the variety Burke was 33 per cent. smaller than that of Mulga, while the grain of Palestine x Dawn R4-1-1 was 23 per cent. larger than Mulga. With a uniform percentage germination, it would be necessary to sow the Palestine x Dawn crossbred at 74 lb. per acre, Mulga at 60 lb., and Burke at 40 lb. per acre to obtain the same number of plants per acre, or per foot of drill row. It is quite probable that the reputation that Burke has gained as a grazing oat is due to a large extent to the extra plant density resulting when it is sown at the same rate as other varieties.

When oats are sown for green feed in the winter and allowed to recover for grain, the heavier rates of seeding, in addition to producing more green feed, under favourable conditions will give increased yields of grain. In a test extending over the three years 1935 to 1937, the variety Algerian was sown at rates of 30 lb., 50 lb., and 70 lb. of seed per acre and after a winter grazing the plots were allowed to mature. The following grain yields were obtained.

Rate.	Three Years' Average.
lb. per acre.	bus. per acre.
30	13·6
50	14·1
70	14·8

A normal rate of seeding for oats grown under Mallee conditions would be about 50 lb. per acre. If sown with the object of feeding-off, heavier seeding is recommended. Rates of up to 70 lb. per acre may be applied with advantage in such cases. If the season turns out to be so favorable that grazing of the oat crop is unnecessary, no loss, and probably a gain will result from the heavier seeding.

Effect of Manures on Amount of Early Green Feed Produced.

The use of superphosphate or super. and ammonia mixtures with oats sown on stubble land in the Mallee will result in an increased yield of hay, but in tests at Walpeup the additional hay produced has not been sufficient to pay for the manure applied. It was noticed, however, that the plots which received manure showed more growth in the winter than those not manured. The amounts of greenstuff produced by the various manurial treatments were measured by sampling in July. The plots were sown in early May with 50 lb. of seed and the variety tested was Mulga.

The monetary value of the green feed is rather difficult to determine, but from the carrying capacity of green oats in other trials, a value of 7s. 6d. per ton may be placed on the green feed growing in the paddock. Using this figure, and the landed costs on the farm, of the various manures, the economic result of manuring oats for green feed is set out in Table V.

It is apparent that, under the low rainfall conditions of the Mallee, the use of fertilizers to promote the growth of oats for green fodder is not justified. In special circumstances, the value of feed may be greater than that allowed in this table, and the use of some superphosphate may be advisable. However, the cost of the super.-ammonia mixtures eliminates the possibility of their use for this purpose.

Palatability of Oat Varieties.

A factor of importance is the palatability of the feed produced. When large paddocks sown to two or more varieties are grazed, sheep may punish one variety and neglect the other. Close observation at each grazing has shown that Mulga is apparently the most palatable of the varieties tested. Others for which a preference was shown included Lachlan, Gidgee, Early Kherson, Belar, Kareela, Dawn, and Palestine x Dawn R4-1-1, while those comparatively neglected included Algerian, Ideal, Burt's Early and Algeribee.

Chemical analysis of oat varieties made throughout the growing season did not reveal any consistent differences in chemical composition. At the first grazing the early varieties had a slightly lower protein content than the late ones, but this was probably due to their more advanced stage of growth. At the later grazings there were no significant differences in the protein content of any of the varieties. Even at the last grazing the amount of crude fibre was not great.

The nutritive ratio of young green oats is approximately 1 : 4, which is a fairly narrow ratio, suitable for fattening sheep, or for ewes rearing young lambs.

Other Cereals for Grazing.

Throughout these investigations, the fact that other cereals may give more grazing than oats was not ignored. There are many advantages accruing from the use of oats in the Mallee. Oats are a good rotation crop with wheat, as they are resistant to most wheat diseases, while in a good

TABLE V.—GRAZING OATS—NET RETURN AFTER APPLYING MANURE.

Manurial Treatment.	Average Yield Greenstuff, Four Years, 1936 to 1939.	Increase Due to Manure.	Value of Increase at 7s. 6d. per ton.	Cost of Manure Used.	Net Result.
lb. per acre.	cwt./ac.	cwt./ac.	s. d.	s. d.	s. d.
No manure	16·4	..	..	..	..
Super., 30	19·3	2·9	1 1	1 2	0 1 loss
Super., 60	22·9	6·5	2 5	2 4	0 1 profit
Super., 30 + amm. sulph., 30	21·0	4·6	1 9	4 11	3 2 loss
Super., 60 + amm. sulph., 30	25·6	9·2	3 5	6 3	2 10 loss
Super., 60 + amm. sulph., 60	25·2	8·8	3 4	9 10	6 6 loss

year they provide either a good hay or grain crop if allowed to recover after an early grazing. Barley is susceptible to most wheat diseases, especially root rots, and for this reason is not a suitable rotation crop. Rye has a reputation for growing well on light, sandy soil, and providing good green feed. Its grain commands a good price on a limited market, but rye does not make a really good hay. When grazed it must be kept well eaten down, otherwise it becomes coarse and unpalatable. It has been found that rye will give more green feed than other cereals. The variety of rye commonly grown in Victoria is Black Winter, but in South Australia there is a strain which gives much more early, but less late growth than Black Winter.

The average yields of greenstuff obtained from the various cereals for the three years 1937 to 1939 are shown in Table VI.

Table VI.—Yields of Greenstuff from Various Cereals 1937 to 1939.

Variety.	First Grazing.	Second Grazing.
	cwt./ac.	cwt./ac.
Black Winter rye ..	14·3	14·1
Dawn oats	10·0	8·8
Rance 4H wheat ..	9·5	10·7
Cape barley ..	8·3	9·9

Cape barley did not live up to its reputation for providing early feed. At each of these two grazings rye has been outstanding, but in 1939, when the plots were grazed until November rye did not show to advantage in the late feeding and in addition it became very coarse.

A disadvantage of rye is that it may become an impurity in the subsequent wheat crop, but as it is normally cross-fertilized, single plants usually are more or less self-sterile and very few, if any, grains are formed.

There may be advantages to be gained from sowing mixtures of cereals for grazing. South Australian rye and Algerian oats should be suitable, the rye providing early feed, and the oats late feed. The same result could be obtained by using an early and a late variety of oats.

Summary and Conclusions.

Oats for grazing should be sown as early in the season as possible. If sown dry, they can come away with the first rains and provide early winter feed.

The results of comprehensive experiments at the Mallée Research Station, Walpeup, have shown that, for early grazing, early-maturing varieties such as Mulga and Belar, have given the most feed. Algerian is most suitable if grazing later in the season is the main consideration.

For providing feed throughout the year, a mid-season variety, Dawn, has proved most satisfactory. It is little inferior to the early varieties for early feed, and it is almost as good as Algerian for late feed. In the aggregate it has given more feed than either the early or late maturing varieties tested.

The capacity of varieties to recover after a spring grazing is largely dependent on spring rainfall, and will be influenced by their habit of early growth.

If a good recovery after grazing is to be obtained, grazing should be discontinued before the plant commences upright or reproductive growth. For oats sown in early May at Walpeup, this takes place about the end of July for early-maturing varieties, and about a month later for Algerian.

When grazing only is required, a heavier rate of seeding than normal should be adopted, and up to two bushels of normal seed per acre is recommended.

There are large variations in the size of the grain of oat varieties. This factor should be borne in mind when deciding the seeding rate to be adopted.

The experiments indicated that the use of manures sown with the oats to increase the amount of grazing is not justified in the Mallee.

Some varieties apparently are more palatable than others, but chemical analyses do not show significant differences between varieties, nor do they indicate material variations in forage value.

Rye corn has out-yielded oats for green fodder, but it is not to be preferred to oats for early grazing if the crop is to be allowed to recover for hay or grain.

"Bacchus Marsh" Subterranean Clover

A New Early Strain

By F. R. Drake, B.Agr.Sc., Assistant Agrostologist

THE production of seed in commercial quantity of an early flowering strain of subterranean clover, known as Bacchus Marsh, is announced. Arrangements have been made to bring this strain under the Victorian seed certification scheme, and the seed harvested from certain areas this season will be certified as true to type.

This strain was first isolated from fields, in which the clover had appeared voluntarily, at Myrniong, near Bacchus Marsh. The original seed was distributed for trial under the name Bacchus Marsh, and although seed is not at present being harvested in this district, the name is being retained in accordance with the custom of naming a strain after the district from which it was first isolated.

Fig. 1.—Bacchus Marsh subterranean clover. Compare with Fig. 2.

With several distinct strains of subterranean clover on the market, it is becoming increasingly important that farmers should be familiar with the various strains available, and the

Fig. 2.—A single plant of the Dwalganup strain of subterranean clover. Compare with Fig. 1.

special adaptations of each, so that they may choose the one which their country is best able to support.

The strains of subterranean clover usually are classified according to their time of flowering, into early, mid-season and late strains, the early strains being best suited for relatively dry areas, and the later strains for districts with a more liberal and reliable rainfall. Generally speaking, there is a marked increase in leafiness and productivity with increasing lateness of maturity. Thus in any district it is desirable to grow the latest flowering type which the local climatic conditions will allow to reach full development. If, however, too late a strain is grown, it is likely to encounter difficulties towards the end of the season, which may result in the death of many plants without seed having been set. Restriction of seed setting will seriously reduce the dry grazing value of a stand, and under such conditions an earlier flowering strain, able to grow in harmony with local conditions, would be safer and more productive.

The standard subterranean clover type of commerce, usually known as Mt. Barker, is a mid-season variety, and as such is well suited to the average conditions in southern Victoria, although in the later and heavier rainfall parts, Tallarook is proving its superiority. In the more northerly districts, however, the Mt. Barker type often fails, or makes unsatisfactory growth. Under such conditions an early flowering type, which matures its seeds before the onset of dry weather, is required. At present, the principal early strain is that known as Dwalganup, a strain developed commercially in Western Australia and now available in large quantities in Victoria. Dwalganup is a very early flowering strain, and the plants are characterized by long, sparsely leaved runners, so that the total produce from a single plant is rather meagre. Although this strain has given satisfactory results in some cases, it is an extreme type. The gap between it and Mt. Barker is so wide as to suggest the use of an intermediate type for establishment in the drier belt of country immediately beyond the districts of moderate rainfall (over 21 inches), where the mid-season strain (Mt. Barker) is now growing.

The Bacchus Marsh strain has been chosen as the most promising of the strains whose flowering period falls between those of Dwalganup and Mt. Barker. It is almost as leafy a plant as Mt. Barker, and is definitely leafier and more productive than is Dwalganup. It is a vigorous grower, continuing to make vegetative growth well into the spring and setting a heavy crop of seed. It commences flowering from two to three weeks later than Dwalganup, and ten to twelve days ahead of Mt. Barker. Observations at Burnley have indicated that this strain has a special capacity for establishing rapidly from self-sown seed, thus providing feed quickly after the autumn break, and this early growth appears to hold well through a subsequent dry spell.

Fig. 3.—A single plant of Bacchus Marsh subterranean clover from a field at Smeaton.

Figures 1 and 2 illustrate the differences in habit of growth, leafiness and productivity of single plants of the two strains Dwalganup and Bacchus Marsh, at an equivalent stage of growth (full flowering). Figure 3 shows a single plant of Bacshus Marsh from a field at Smeaton.

It must be pointed out that the differences in vegetative growth illustrated are correlated with differences in flowering period and length

[Continued on page 128.

Barbed Wire Wounds in Horses

MANY veterinary practitioners when their chief work was in the treatment of horses expressed the opinion that barbed wire was worth some hundreds of pounds per annum to them, and even yet in the cases of valuable stock an owner is well advised to consult a practitioner for severe cases.

From long practical experience it is found that, in general, stitching of wire wounds is unnecessary, and in fact it actually complicates the condition. The drawing together of the edges of the skin of a large laceration gives a neat appearance to the injury for some period up to about twenty-four hours, but it must be remembered that all wire injuries in animals are infected and the reaction to infection results in an oedema, or swelling with pus formation; as a result, the stitches invariably break out, and much labour, time, and expense are wasted, and the wound is not in as good a condition to commence treatment as when freshly done.

The first thing to do in the open treatment is to clean up the wound and its surroundings; hair should be clipped from the edges of the laceration, and for some considerable area below it. The wound should then be washed with a good antiseptic solution. One ounce of any of the reliable liquid antiseptics to a quart of water makes a suitable strength. Any flap of skin, no matter how large, should be cut off with scissors or razor at its base, and then the routine treatment of dressing twice a day with the undermentioned oily dressing is carried out.

One ounce of pure liquid carbolic acid and three ounces of turpentine are placed in a bottle and made up to one pint with raw linseed oil. The mixture should be thoroughly shaken before being poured out. For each dressing a small quantity—usually an ounce, will suffice for a large wound—should be poured out into a tin or cup. To apply the dressing, a piece of cotton wool wrapped round the end of a wooden penholder and lightly dipped in the oil, is used to rub over the wound. Any pockets in muscular tissues must be swabbed out, and the edges of the wound, hardened by coagulated blood, should receive particular attention.

During the first days of treatment several fresh swabs should be used at each dressing, but as healing progresses, one will be found sufficient.

After a day or two, it will be found that scabs form over the surface of the wound; these should be rubbed off at each dressing operation and any that are firmly attached and fail to rub off at first will, by constant use of the oil, eventually soften and come away subsequently. If correctly treated, the scabs that follow will remain soft and be easily removed.

Rarely is it necessary to wash the wound during the prolonged treatment, but should it become soiled with foreign material, either by accident or by reason of its position on the animal, no harm is done by washing it. The area below the wound should, however, be washed with soap and water and scraped clean each day to remove any discharge. Smearing the skin with vaseline facilitates this cleansing.

Bandaging is not recommended, and dressing should be continued even after the wound has contracted to a small area, as by doing so the skin edges keep advancing inwards and less scar tissue will remain. Healing of large open wounds takes place by the formation of granulation tissue, and excessive amounts of such tissue, referred to as proud flesh, often worry the owner of the animal. With the treatment carried out faithfully as described in this article there is no need for concern. At times it might appear that there is excess of this healing tissue, but provided the skin flaps have been cut off and that there are no wrinkles, the dressing will do all that is necessary in contracting the granulation and drawing in the skin.

Persons who have used this treatment have been astounded at the results obtained; perseverance is the keynote, and large wounds across the forequarters and arm will heal so well that little more than a line of scar is formed.

The same treatment is most effective for sore shoulders if the horse is not required for work until complete healing results, in which case the unsightly black hairless collar scars resulting from the use of quick healing powders are conspicuous by their absence.

Average specimen apple trees in British Columbia.

[Dept. Agri., B.C.

Australian Apples and Pears

By J. M. Ward, Superintendent of Horticulture and State Supervising Officer (Fruit), Victoria.

To investigate the outturn of Australian fruit on the oversea markets and to compare it with fruit from other countries. Mr. Ward visited England and the Continent on behalf of the Commonwealth and Victorian Governments. His observations on the fruit and the conditions of handling and marketing together with recommendations are set out in the following report.

WHILE in the United Kingdom the ports of London, Hull, Glasgow, Liverpool, and Southampton were visited for the purpose of examining apples and pears and making contact with firms handling Australian fruit. At these places a close examination was made of the fruit upon discharge, and again when displayed for sale. Markets and auction sale rooms were visited, and matters of mutual interest were discussed at length with many representatives of the fruit trade. As a result much information of value to the fruit industry was obtained.

Marketing.

As is generally known, there are two systems of marketing in the United Kingdom, i.e., sale by auction and sale by private treaty.

Auction Sales.

A sample box of fruit from each line is displayed in rooms adjacent to the sale room, giving buyers an opportunity of making a close inspection of the quality and variety for some two or three hours before the sale. This enables them to decide beforehand the prices they are prepared to pay.

A typical English orchard. [East Mall. Res. Stn.

The following is an example of the display of sample box. Grower or shipper "A" has, 100 boxes in a consignment; these may include four varieties, in which there are three sizes or counts in each variety. A box of each variety and each size is displayed. The sample in question may be of good, bad, or indifferent quality, slack, or good pack, and the consignment is sold on the sample. Such sample box is again displayed and often tipped into a basket in the auction room at the time the sale is in progress, giving the buyer every opportunity of knowing the class of fruit he is about to purchase.

The retailer or small buyer does not operate at auction sales. He obtains his fruit from one who buys in a large way, either at auction, or privately.

Private Treaty Sales.

Private treaty sales are made at the dock, at the market, or the warehouse, and the buyer examines the fruit at one of these places where samples may be inspected. These buyers purchase for wholesalers, semi-wholesalers, or retailers.

A parcel of, let us say, 2,000 boxes of a well-known brand may be purchased without examination and distributed from the dock, &c., to provincial or other buyers. If such fruit, upon arrival at destination, is not up to quality, it is often returned to the original purchaser —i.e., the importer. As an instance of this, I was called in to examine a line of 400 boxes that had been sold to a Midland buyer, who returned them to the original merchant in London because of their poor condition. This merchant informed me that he had purchased 2,000 boxes at 11s. 9d. c.i.f. The 400 boxes in question were portion of this lot, and were thrown back on his hands. The apples were badly affected with bitter pit (Granny Smiths), some (Jonathans) had the appearance of being overripe (probably scald), while the pears (B. Bosc) were rotten. He hoped to make a sale of them at 6s. per box. They were really not worth anything, yet this fruit would be in really good condition at the time of shipment, as far as could be judged by the eye.

The point I desire to make here is that the original purchase, or catalogue price, or even an account sales, is really no criterion of the quality or condition of the fruit, and the loser is the importer or original buyer, and not the grower or shipper in Australia.

This is a most important point. The foregoing instance is only one of many that could be quoted. Fruit sold on consignment may vary a little from this; it depends upon circumstances.

Condition of Fruit.

Generally speaking, the condition and quality of Australian fruit upon arrival, or a few days later, was satisfactory, yet on the other hand there was too much fruit in anything but a satisfactory condition three or four days after discharge. The real test is the condition of the fruit a week or two weeks after discharge. Any one with little or no experience of fruit export in Australia would jump to the conclusion that we were shipping a considerable quantity of overripe and poor quality fruit. This is far from being the truth, although odd boxes of fruit occasionally do escape detection by inspectors.

If our trouble was due to poor quality, grading and packing only, it could be easily remedied, but the trouble is more deep-seated, and I feel that most of the trouble is due to the

length of, and condition during, ship's carriage. In making this statement I am not overlooking faults that can be overcome in Australia.

The worst of the Victorian fruit that came under notice was Beurre Bosc pears. A few days after discharge a large quantity of these was in a really rotten condition. These pears could be only in a hard, green condition at the time of shipment from Melbourne, as it would be impossible there, to obtain pears of this variety in a forward condition at the period of the season they would be shipped. Similar pears are kept in local cool stores for several months in perfect condition. In stating this, the defects of the Bosc are not overlooked. The sooner we cease shipping Bosc pears the better for our pear trade, that is unless we can overcome carriage or storage defects. It is felt that certain steamers may be faulty fruit carriers. A considerable amount of research relative to sea carriage yet remains to be done.

The two outstanding troubles with apples are immaturity in the early part of the season and overripeness and/or scald later on. The immaturity concerns the early shipments, when bitter pit is most pronounced. Shrivelling occurs, causing the apples to look like "old men," and they lack apple quality. Overripeness is noticeable mostly on Jonathans. There appears to be two causes (1) probably "hot-spots" in the ship's hold, and (2) over-mature apples not detected at the time of shipment.

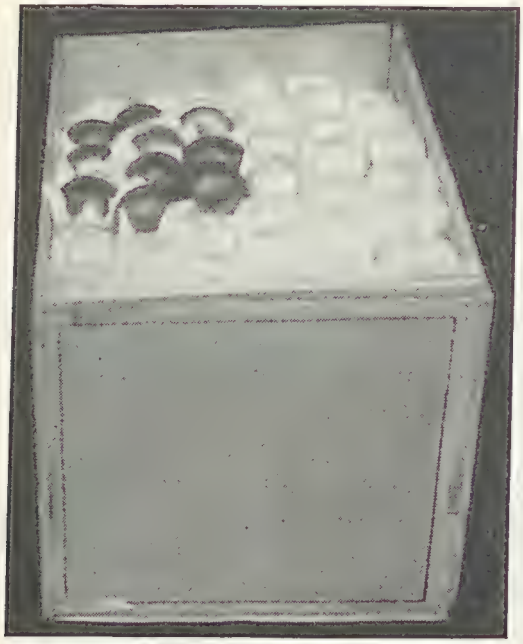
In looking back, one is forced to acknowledge the fact that many growers or shippers keep portion of a packed consignement of Jonathans in ordinary store or wharf shed for a week or more before shipping, and only research workers have realized the amount of damage that is taking place during this temporary storage period. The Jonathan really has a short harvesting season. This variety should be fully harvested—so far as export is concerned—in from two to three weeks and cool-stored while awaiting shipment. If it were practicable to carry them in a separate hold at an arranged temperature, greater success would result. Victorian investigators have been studying this subject, and I would like to see their findings put into operation on a large scale.

A very tall tree of Bramley's seedling. [Min. Agri. & Fish.

Bramley's seedling—a low spreading tree. [Min. Agri. & Fish.

It must be admitted that so far as Victoria is concerned, we have allowed shipment of Granny Smith apples at too early a date. In future this variety will not be allowed export during the month of February and possibly not until the middle of March, according to circumstances.

The fact must not be overlooked that the writer is stressing the faults and not the good points of the condition of our fruit in the



Slack-packed Australian apples on show in a London sales room—1939.

United Kingdom; one could give much praise as well as find fault.

The subject of immature apples has been much discussed for some years past, and has never been satisfactorily settled and probably will not be for some time. After deep consideration and discussions with English importers, I have arrived at the conclusion that the importers are well aware of the arrival condition of these early shipments of immature apples, yet they continue to insist on buying this class of apple from their Australian representatives, and, I understand, other countries, yet bitterly complain about the condition on arrival. They expressed to me the desire that officials should prevent the shipment of such fruit and protect them—the importers—from themselves.

Without hesitation, I make the statement that the fault lies mainly with the importers, and if they wish to avoid the trouble they should cease to make forward purchases until the fruit is more mature. Few, if any, are shipped on consignment from Victoria during the month of February—they are practically all sold f.o.b. or c.i.f. I am not in a position to state what the actual effect of these immature apples is upon later sales; it depends upon a number of circumstances.

Buyers in the United Kingdom require *green* Cleopatra apples and these are worth from 1s. to 2s. per box more than yellow ones.

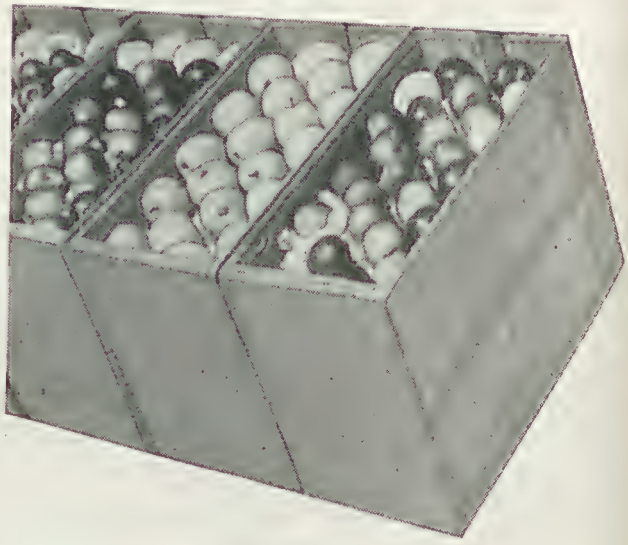
Grading, Packing, and Boxes.

Grading.—On the whole there is little fault to be found with grading so far as size and quality are concerned, except that an improvement could be effected in respect to colour grading. Too many apples with little or no colour are packed with coloured ones. In this respect our inspection—all States—could be tightened up. The fault really lies with the careless grower or shipper who must be dealt with in a drastic manner. Other weaknesses to which attention should be drawn are the limb, tree, or box marks upon certain varieties of pears: box and limb marks on Josephines and Packham's, and tree or cluster marks upon Winter Cole pears. Russet is also a source of trouble.

Too many growers pack "border-line" fruit. In future we should not hesitate to reject this class of fruit instantly when submitted for export.

The grading to size of our fruit is at least equal to that from other countries. We should, however, endeavour to improve upon our colour standard; 20 per cent. of colour on Jonathans is far too low. 50 per cent. should be the minimum requirement for this variety.

Packing.—The one great fault to be found in our pack of apples is slackness. Far too many boxes are slack packed. A great number



Another example of slack-packed fruit. Dump boxes on display in a sales room, London.

of those seen could well have had another layer of apples. It was no uncommon sight to see boxes on display showing the fruit anything from 1 inch to 2 inches below the top of the box. The packer would pack, say, the 6 x 5 (Standard box) whereas it should have been the 6 x 6, or the 6 x 6 where the 6 x 7 should have been packed.

We must get into the habit of packing a larger apple for the different counts. Where, for instance, we have been packing the bare 2½ in. for a certain count, we should pack the 2⅝ in. for the same count, that is, keep up on the size. One does not overlook the fact that shrinkage is responsible for a certain amount of slackness.

The extreme "crown" pack of W.B.C. pears adopted in California. The "crown" or "bulge" measured 4½ and 5 inches.

Some countries are inclined to overdo the "bulge" or "crown," and Australia should avoid falling into the same error. Boxes of Rome Beauty apples from a certain country could be seen in Covent Garden market with a "crown" high enough to allow one to pull 2¾ in. apples from the unopened box with ease. Fruit in these boxes is often damaged. Nevertheless while some countries overdo the "bulge" or "crown" we in Australia do not properly fill the boxes. Naturally enough there are exceptions. Any box of apples submitted for export which shows the slightest sign of slackness should be instantly rejected.

Pears packed in the "long" or "flat" box, however, should be made the exception to this rule. It is better for pears in this box to be packed a little on the slack side rather than too tightly; pears (particularly clear-skinned varieties such as Packham's Triumph and Josephines), are easily box marked, and this is a great disadvantage when submitted for sale.

The smooth, stiff paper lining used by some exporters was a distinct improvement on corrugated strawboard, and its use is strongly recommended to all concerned.

The subject of sizes and counts was discussed with many of those in the fruit trade at all ports and, without exception, the writer was informed that the trade required pears to be packed to counts and not sizes. All pears in the United Kingdom are sold retail by number, and wholesale and retail buyers require to know the number of pears contained in a box. One could often hear buyers at auction enquiring as to how many 2¼ in., &c., pears were in a box.

Count.—Many importers stated that all pears below 2¼ in. should be omitted from "Fancy" grade and put into "Good" grade. I fully agree with this. In fact, I would limit all grades to 2¼ in.; this should be the minimum size for both apples and pears.

The counts for apples required in the United Kingdom are 125-138 (a limited number as early cookers), 150, 163, 175, 188, 198, 216, 234, 252, and Cox's 270 and 288. Of these, the following are required for Glasgow, 125, 138, 150, 163, also a limited number of 175.

Just here it could be mentioned that packing houses in Canada and the United States of America have a number of other counts in addition to those mentioned, but they are used for internal trade and not exported to the United Kingdom markets. Every country, except Australia, exporting to England packs both apples and pears to counts. In practice, packing to correct counts can be done only in a properly-equipped, well-managed packing house.

Boxes.—Fruit brokers, merchants, &c., did not hesitate to advise Victoria to retain the "flat" or "long" pear box (26 in. x 14½ in. x 6 in. (internal dimensions, with a central division)). This box is well and favourably known by all who handle Australian pears. Several merchants stated that on the same

market it commands 1s. to 3s. per box higher than the Standard box, but it must contain not less than 40 *lb. of fruit or the correct count.*

An excellent instance of the value of this box came under the writer's notice at an auction sale in Glasgow. The S.S. *Dorset* arrived at this port in June with approximately 12,000 boxes of pears, about 10,000 boxes being from Victoria and the remainder from Tasmania. There were only two brands from Victoria and over twenty from Tasmania. The Victorian lots were in the "flat" box and the Tasmanian in the hardwood "Standard." The varieties were the same from both States, i.e. B. Bosc, Josephine de Malines, Glou Morceau, Packham's Triumph, W. Cole, and a few Doyenne du Comice and Giblin's from Tasmania. With the exception of Comice, which realized from 12s. 6d. to 14s. 6d., the Tasmanian pears sold for 7s. 6d. to 9s. 9d. per box, and those from Victoria from 12s. 6d. to 17s. per box. The whole of this fruit was sold within the hour in the same auction room to the same buyers.

There was little or no difference regarding the quality of the fruit from the two States, and when I spoke to the two auctioneers—two firms did the selling—both pointed out that buyers would not be bothered with small lines and a multiplicity of brands, and the two Victorian brands were well and favourably known. One Tasmanian grower's 50 boxes on sale included four varieties and not less than three sizes for each variety. His fruit was well packed and of good quality, yet on a market worth from 12s. 6d. to 17s. his fruit realized 9s. 9d. only.

The hardwood box, as at present made up, is anything but creditable to Australia (the Western Australian apple box is the exception in appearance) and really should be eliminated from export. Even if it costs a little less for the timber, growers are losing money by using it. I feel sure that the timber used for these boxes could be put to a more profitable use, but it is difficult to convince growers that it is to their own interests to disregard this box. In this respect I feel that the Commonwealth

Apple orchards in the Hood River valley, Oregon, U.S.A.

Apple trees, seven to eight years old, Oregon, U.S.A.

Government would be doing a really good service to the industry, and to Tasmania in particular, if it prohibited the export of the hardwood dump.

The feelings of Western Australian growers in respect to the red jarrah, &c., box is well known, but I feel certain that if they fully realized the disabilities of that box in England they would adopt the pine Standard box. A note made by the writer while examining Australian apples during discharge at the dock reads as follows:—"Practically all boxes under repair are W.A. 'dumps' (Red). Nails spring out. Labourers drop them readily, possibly on account of extra weight." In repairing these boxes it is no uncommon sight to see them patched up with a white pine side, lid, bottom, &c. The ends in particular split very easily. If growers and shippers continue to use these boxes, they should be wired.

If Australia is to deliver really well-packed boxes of apples or pears, in the respective Standard boxes, suitable timber, including a thinner and longer lid ($\frac{1}{4}$ in. to $\frac{3}{8}$ in. longer) must be used, while the proper nailing and handling equipment is essential. Generally speaking, the lid now in use is too thick (that is if the box is properly filled).

Handling Fruit at Docks.

Never in my life have I seen boxes of fruit handled in such a rough manner as is the case at the various London and Liverpool docks. The other ports are not so bad as London and Liverpool. There were times in the dock sheds when conversation was practically impossible because of the noise being made with the throwing about of the boxes. It was no uncommon sight to see a box of apples or pears thrown 5 or 6 feet, and it is a common practice for a wharf labourer to throw a box from his shoulder on to a concrete floor. A note made during the discharge of one steamer reads:—"Royal Albert Docks, 5/5/39. A great deal of coopering of boxes. It appears to me that shipping companies deliver boxes in good order, but no thought is given to the condition of fruit."

The matter was discussed with dock superintendents, overseers, foremen, importers, and later at a conference with the Australian Tonnage Committee representing the various shipping companies interested in the carriage of

Showing fruit cars (railway trucks) loading apples and pears at packing houses, Columbia River, Wenatchie, U.S.A. Each car holds 756 boxes of apples.

Australian fruit to the United Kingdom. It is very evident that few people interested in the importation of fruit to England have the slightest idea of what good handling of fruit means, and after seeing the really rough treatment our fruit receives at the two ports mentioned, one is proud of the way the water-side workers handle the fruit at the Port of Melbourne, and I had no hesitation in making this statement to those concerned in England. The stevedoring companies in Melbourne take a keen interest in careful handling of export fruit.

During the discharge of Australian fresh fruit, in at least the port of London, four or five coopers are employed in repairing boxes at every ship, and no thought given to the contents of the box. Naturally enough a great deal of bruising of fruit occurs, and this detrimentally affects its sale. I am firmly of the opinion that the importers should make an organized effort to improve the handling during discharge and, later, that they should take responsibility for decent handling, as they are really the owners of the fruit, although the bruised fruit detrimentally reflects upon Australia. I feel that if one or two men of the right temperament seriously took the matter up and persevered with it, they could vastly improve the position.

Canada and U.S.A.

Leaving England on 14th July, 1939, in company with the State Supervising Officer from Tasmania (Mr. S. H. Grueber), I arrived at Montreal, Canada, on 22nd July, and next day left for Ottawa, where officers of the Dominion Department of Agriculture were met, and matters in connexion with inspection and cultural methods of fruit fully discussed. Packing houses, markets, and orchard districts in various parts of the Provinces of Quebec and Ontario were visited and methods of grading, packing, and inspection, and orchard practices closely examined.

Continuing the tour to New York, and then via Chicago, Denver, and Salt Lake City, to the Pacific States of California, Oregon, Washington, and British Columbia (Canada), many packing houses (citrus and deciduous), markets and orchards were visited, and matters relative to inspection, grading, packing, and marketing closely studied.

It was noticed that in packing pears, the Standard pear box was the only one in use, apart from small trays, baskets, &c., for local trade. Many of the pear boxes had an excessive "crown" or "bulge," some of them measured as high as 5 inches above the top of the box before nailing down; this was before pre-cooling. Some packing houses pack 50 lb. of pears and guarantee a nett. weight of 46 lb. of fruit per box, allowing a loss by shrinkage of 4 lb. I consider that many of these packing houses overdo the "crown," and I mentioned that if they desired such a quantity of fruit in a box, they should build it large enough, or pack into a barrel instead of turning the box into a semi-barrel. Few, if any, disagreed with these remarks. The packers in British Columbia do not have such an excessive bulge. The grade and quality of fruit is on a par with those in Australia. The majority of packing houses use a smooth, stiff lining paper to avoid friction between fruit and wood.

Practically all packing houses have complete washing plants for the purpose of removing arsenical residue from the fruit. These remarks apply more to the United States rather than to Canada, where arsenate of lead is not so noticeable on trees and fruit.

The best display of fruit exposed for sale, was in New York on one of the wharf piers. Here could be seen consignments of all kinds of fruit in stacks, without overcrowding, extending some 250 to 300 yards in length, and some 150 yards wide. Anything up to a dozen or more boxes of each lot were opened for the inspection of the buyers before it was auctioned in adjacent sale rooms, where up to ten auction sales take place at the same time, morning, noon, and night.

The system of inspection is somewhat similar to our own, but shippers pay a fee for much of the work. Details and copies of certificates were obtained.

Horticultural Research Stations.

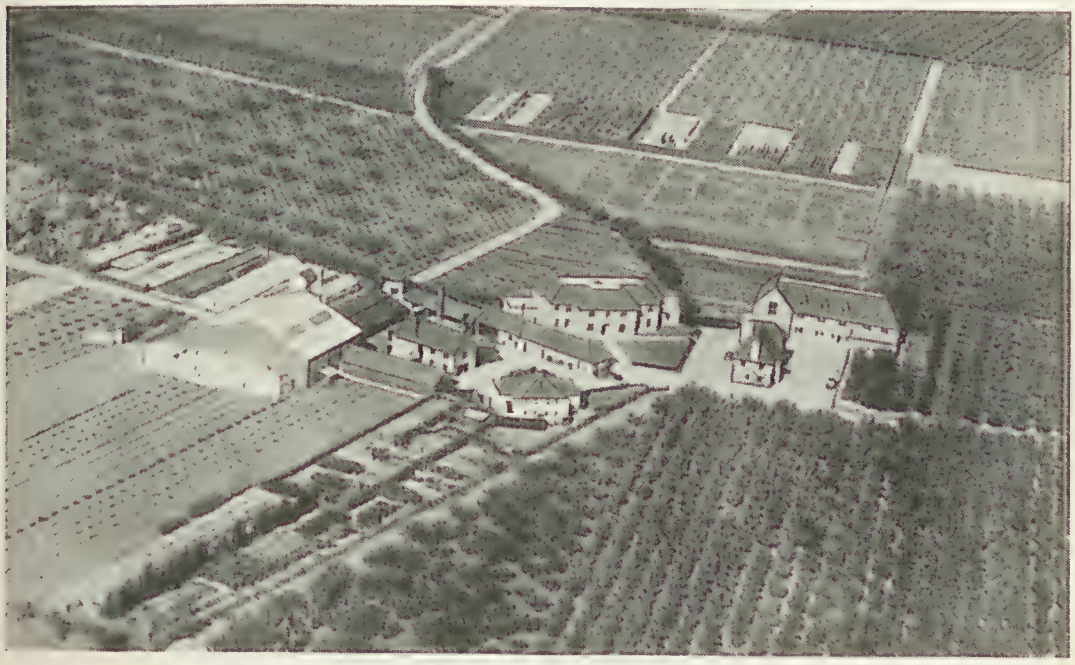
Horticultural Research Stations in England, Scotland, Germany, Canada, United States, and New Zealand were visited. Fruitgrowing problems were discussed with various officials and valuable information was obtained.

One subject of interest to all Australian apple and pear growers is that of control of codling moth. I was hoping to obtain information that would give our growers better control of this world-wide pest, but after a great deal of enquiry I found that the spray programme adopted in Victoria is at least equal to or better than any other that came under notice. As in Australia, a considerable amount of investigation is proceeding to discover better and less costly means of combating this pest.

In California, several packing houses have adopted the system of fumigating pears with methyl bromide after the packed fruit is loaded into cars (rail-trucks), with a view to killing any young larvae and possibly eggs that may be present; great success has resulted from this method of control after harvesting. Needless to state the fruit and trees had been previously well sprayed seven, eight, or more times with arsenate of lead.

Orchards.

A few comments on the orchards of England, Canada, and the United States may be of interest. There is a feeling among many Australian growers that English orchards are small and anything but modern. The reverse is really the position. The modern English orchard is something to be proud of. Only a few well-known commercial varieties have been planted and the area of individual orchards may be anything from 50 acres to 1,200 acres. They are well catered for in respect to control of pests, up-to-date packing houses with proper equipment have been built, together with gas storage plants. Some are well cultivated,



The East Malling Research Station, Kent.

A three-year-old apple orchard in British Columbia grown under irrigation. Average annual rainfall 10 inches. [Dept. of Agri., B.C.

others are in turf or sod, and are mowed almost like lawns. This can be done successfully in England owing to the suitable rainfall throughout the year.

The production of apples in England varies up to 15,000,000 bushels per annum. During 1939 season the crop would probably reach 20,000,000 bushels. The County of Kent harvests up to 12,000,000 bushels. The great drawback to a higher average annual crop is the severe frosts experienced during the spring of some years.

I saw many mature orchards carrying up to fifteen bushels per tree. Quite a number of seven and eight year old trees carried from six to eight bushels per tree. Growers depend upon various East Malling grown stocks, (vegetatively propagated). Details of these stocks can be supplied to Australian growers by the various State Departments of Agriculture.

Northern Spy is not used by any grower commercially, in fact, it is unheard of among commercial growers. This also applies to Canada and the United States. It is a great pity that Australia ever adopted this stock for all varieties and for all climatic and soil conditions. This stock is largely responsible for the low yield of many of our orchards. It is well known that Australia has some good apple orchards on Spy stock, but they are the exception rather than the rule.

The orchards in Canada, United States, Germany, and Holland produce heavy crops, the exception being when frosts reduce them in Germany and Holland. The stocks used are mostly crab seedling, but considerable experimental work on stocks vegetatively propagated is being carried out in many parts of the fruit-growing world, along the lines of those at East Malling and Long Ashton research stations.

The fruit district of Wenatchee, State of Washington, U.S.A., covers approximately 32,000 acres of apples, and the production of these during 1939 was 12,474,000 bushels, which is about the average production of the district. These figures are official, and cover the quantity shipped to various parts of the U.S.A. and other countries, and do not include the apples used for manufacturing or processing purposes. The average Victorian production of apples over a period of the past five years from approximately 30,540 acres is 2,450,000 bushels.

Warracknabeal Wheat Crop and Fallow Competition, 1939

Report of the Judge—B. F. McKeon, B.Agr.Sc., Science Field Officer

ALTHOUGH very satisfactory yields were obtained over the major portion of the Wimmera during the past season, wheat crops in the Warracknabeal district were disappointing. A considerable area of country extending from Sheep Hills north to Brim and east to Bangerang, experienced very unfavourable conditions during the spring, and only light yields would be obtained.

Despite these discouraging conditions, 52 entries, comprising 30 crops and 22 fallows, were exhibited in the competition conducted by the Warracknabeal Agricultural Society.

The season opened with excellent autumn and winter rains, and crops generally made good early growth. By the middle of September the stage appeared set for record yields in the district. Within a few weeks however the position was completely reversed, due to the failure of the spring rains together with a succession of severe frosts. Almost every crop inspected had been damaged to a greater or less extent by the combined effects of moisture shortage and frost. Substantial rains which fell early in November were, in most cases, too late to be of much value to the wheat crops and resulted in the development of second growth. Crops on strong land were most seriously affected by the dry spell, while on the lighter sandy loams and Mallee soils some very fair yields would be obtained.

Varieties.

Throughout the competition five varieties of wheat were exhibited, namely, Ghurka, Dundee, Ranee 4H, Free Gallipoli and Bobin. Of these, Ghurka represented 71 per cent. of the entries, or 1,600 acres of the 2,200 acres of crop inspected.

Wheat variety plots in the Wimmera.

For many years Ghurka has proved the most suitable wheat for general use on Wimmera land and is recommended for main sowings on black ground and on red and mixed land. In recent years the variety Dundee has enjoyed increasing popularity in the Wimmera, but it is significant that in this competition only one crop of Dundee was exhibited, compared with eleven entries on the previous occasion. Although Dundee is usually superior in baking quality to Ghurka, being in the "medium strength" class, departmental tests to date indicate that on black ground it is inferior to Ghurka in yield. Best results with Dundee have been obtained on red and mixed land and it is at present recommended for limited sowing on those soils.

Of particular interest to Wimmera farmers is the new crossbred Major x Free Gallipoli.* On the recommendation of the Victorian Wheat Advisory Committee this variety will be released to growers and limited seed supplies made available for the coming season. Tests over the past four years have demonstrated the possibility of this new wheat in the Wimmera district, particularly as a variety to replace Free Gallipoli. Major x Free Gallipoli is a white chaffed, late maturing wheat with a fairly tall, strong straw and good harvesting features. The grain is of average size and colour, and baking tests have shown that its flour is approximately equal to that of Ghurka and superior to that of Free Gallipoli. Like this latter variety, it is susceptible to flag smut.

Seeding and Manuring.

Most of the competition crops were sown from late May to mid-June under favorable conditions. The average rate of seeding over all crops was 73 lb. per acre, while the dressing of superphosphate ranged from 60 lb. to 1 cwt. per acre, averaging in the vicinity of 80 lb. per acre. It is of interest that on three of the crops inspected, zinc sulphate had been applied (in addition to the superphosphate) at rates varying from 7 to 10 lb. per acre. As yet, there is little evidence on the effect of zinc sulphate on the soils of the Warracknabeal district. Experimental plots to explore the possibilities of this mineral on soil typical of a large area of the district were initiated by the Department of Agriculture last year on Mr. R. O. Gould's property but, unfortunately, on account of the very adverse season in this area, no comparisons were obtained. However, a definite response to zinc sulphate was recorded on strong, black land on the farm of Mr. O. P. Pietsch at Kewell North. The crop treated with zinc sulphate (in addition to superphosphate) was several days ahead in maturity of that sown with superphosphate only, and was considerably better headed. Some indication of a response to zinc was noticed also on the lighter sandy loam of Mr. L. H. Marshman's property at Lah.

* This new crossbred has been named Magnet.

Growers desirous of testing this mineral for themselves are advised to apply the zinc sulphate at a rate of 8 to 10 lb. per acre, mixed with the superphosphate. The mixing can be done any time before cropping, as experience to date has indicated that there is little risk of the mixture losing its free-running texture, provided the materials are reasonably dry when mixed. In order that comparisons may readily be obtained, farmers testing the mineral would find it of considerable advantage not to apply zinc to the whole paddock but to leave

Other Features.

Generally speaking, the crops were fairly free from serious competition by weeds although in many cases a scattering of wild oats was present. Most exhibits showed the presence of various root-rot diseases to a minor extent, but the fact that in one crop only was a trace of ball smut detected, indicated that the pickling had been thoroughly carried out. Copper dusts and the new mercury compounds were in general use, while in one instance the seed had been wet pickled in formalin. Very little flag smut was present, due no doubt to the widespread use in the district of Ghurka, which is resistant to this disease.

On the whole the seed was true to type, but the standard of purity in several cases was lowered through the presence of barley. The contamination of wheat crops with barley not only mars the wheat from a seed point of view, but the presence of barley depreciates, to some extent, the milling quality of the sample. Where barley is grown on wheat farms care should be exercised in preventing the admixture of these cereals—particularly in the seeding and harvesting machinery. In addition it is a good practice to hand pick the barley from the area of wheat reserved for seed.

The Awards.

In the Open Crop section, the winning exhibit was a crop of Free Gallipoli grown by Mr. L. Landt, near Aubrey. Although this part of the district had been somewhat favoured by isolated thunderstorms, nevertheless the exhibit was a very creditable crop. It was not particularly dense, but had filled exceptionally well. The crop was adjudged the best exhibit inspected throughout the competition and it represented the Warracknabeal

Bulk handling of wheat—one of the new silos in the Wimmera.

OPEN CROP COMPETITION—50 ACRES OF WHEAT—WARRACKNABEAL.

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Maximum Points ..	.. .. ..	35	20	15	15	15	100
L. Landt	Free Gallipoli	35	19	14	14	13	95
R. C. Holland	Ghurka	30	19	13½	13½	14	90
L. R. Rodda	Ghurka	28	18½	14	14	14	88½
S. J. King	Ghurka	28	19	14	13	14	88

district in the contest for the Champion Wheat Crop of the Wimmera. The entry was grown on land which had been out to grass for three years. The paddock was scarified in July and September, harrowed (with shear points attached) in September, scarified in April, harrowed and sown at the end of June with 78 lb. of seed and 65 lb. of superphosphate per acre.

Second award went to Mr. R. C. Holland of Ailsa with an entry of Ghurka. The crop was dense and even and was expected to yield fairly well. It was somewhat marred by the prevalence of wild oats.

The Hon. L. R. Rodda, with a paddock of Ghurka on red rising ground, and Mr. S. J. King (Bobin) also exhibited crops of merit in the Open section.

The aggregate competition for Heavy Land was won by Mr. O. P. Pietsch, of Kewell North. Mr. Pietsch exhibited an even, clean crop of Ghurka estimated to return equal highest yield of the crops in this section. The crop was grown on even, well prepared, strong black land which, after normal pre-summer cultivation, had received five autumn workings prior to seeding. In March the paddock was harrowed (with shear points attached) and later knife-barred, then harrowed in mid-April, springtoothed early in May, combined early in June and sown at the end of that month with 68 lb. of seed and 80 to 85 lb. of superphosphate per acre, one combine applying zinc sulphate at a rate of 6 to 7 lb. per acre.

Second award went to Mr. F. W. Graetz, with a commendable crop of Ranee 4H which was of good type and promised a fair yield. The crop had been sown in the last week of May with 75 lb. per acre each of seed and superphosphate together with 10 lb. per acre of zinc sulphate. The seed was formalin pickled.

Mr. R. R. King, who gained third award in the aggregate and highest points for the crop, entered a fine exhibit of Free Gallopoli and Ranee 4H, both varieties being true to type and free from weeds and disease.

Mr. A. L. Milbourne, of Brim, gained first place in the Light Land section. The exhibit was a crop of Ghurka grown on red sandy loam. The crop was practically free from weeds, fairly even, and, except for isolated "dead heads" which occurred to some extent in most of the crops, was free from disease. The purity of the seed, however, was of moderate standard only. The paddock had been fallowed after rain late in December, 1937, then cultivated the following June and springtoothed in August. It was worked again with the springtooth in the autumn after rain, and the crop was sown in the first week of June with 60 lb. of seed and 60 lb. of superphosphate per acre and harrowed immediately afterwards.

Heavy Land Section.

(Aggregate competition for 100 acres of fallow, 1938, and crop grown thereon, 1939.)

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Crop Total.	Fallow, 1938.	Fallow and Crop.
				Weeds.	Disease.				
Maximum Points ..	.. .. ..	35	20	15	15	15	100	100	200
O. P. Pietsch	Ghurka	27	19	13½	14	13½	87	94½	181½
F. W. Graetz	Ranee 4H	26	18½	13	14	13½	85	92½	177½
R. R. King	Free Gallipoli and Ranee 4H	27	19	14	14	14	88	89	177
E. Crosor	Ghurka	19	18½	14	14	14	79½	95	174½
S. J. King	Ghurka	17	19	13½	14	13½	77	97	174
L. Landt	Ghurka	18	18	12½	14	13	75½	97	172½
W. G. Rodda	Ghurka	18	19	14	14	13½	78½	93	171½
R. McCollim and H. L. Martin	Ghurka	17	19	14	14	14	78	93	171
R. S. King	Free Gallipoli	15	19	14	14	13½	75½	94	169½
H. J. Bunge	Dundee	17	19	14	14	13	77	92	169
W. Landt	Ghurka	12	18	13	14	13½	70½	95	165½
R. T. Hewitt	Ghurka	13	18½	14	14	13½	73	92	165
Mrs. B. A. Hewitt No. 2..	Ghurka	10	19	14	14	14	71	93	164
H. A. Arnold	Ghurka	8	19	13½	14	13½	68	92	160
Symes Bros.	Ghurka	7	19	14	14	13½	67½	91	158½
Mrs. B. A. Hewitt No. 1	Crops withdrawn ..	..	..	..	..	..	..	93	..
R. O. Gould ..								98	..
W. J. Drage ..								91	..

LIGHT LAND SECTION.
(Aggregate competition for 50 acres of fallow, 1938, and crop grown thereon, 1939.)

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Crop Total.	Fallow, 1938.	Fallow and Crop.
				Weeds.	Disease.				
Maximum Points ..	.. .. ..	35	20	15	15	15	100	100	200
A. L. Milbourne ..	Ghurka	29	18	14½	14	13½	89	95	184
W. G. Rodda	Ghurka and Ranee 4H ..	26	19	14½	14	14½	88	93½	181½
W. Altmann	Ranee 4H	27	19	14	14	14	88	92	180
L. R. Rodda	Ghurka	20	19	14	14	13½	80½	93	173½
K. Hart No. 1	Ghurka	15	19	12½	14	13½	74	97½	171½
K. Hart No. 2	Ghurka	16	19	13	14	13½	75½	95	170½
R. V. Quick No. 2 ..	Ghurka	17	18½	13	14	13½	76	93	169
R. V. Quick No. 1 ..	Ghurka	18	18½	13	14	13½	77	91½	168½
H. T. Dart No. 2 ..	Ghurka	12	19	13½	14	14	72½	92	164½
H. T. Dart No. 1 ..	Ghurka	10	19	13½	14	13	69½	92	161½
L. B. Wurfel	Ghurka	9	18½	13	14	13½	68	91½	159½
L. H. Marshman ..	Crop withdrawn ..	..	..	..	..	..	..	93½	..

Second place went to Mr. W. G. Rodda with an entry of Ghurka and Ranee 4H. Both crops were very even and particularly clean, weeds and disease being practically absent. The crop had been sown on well-prepared fallow with 80 lb. of seed and 100 lb of superphosphate per acre. Mr. W. Altmann's crop of Ranee 4H was also a very creditable entry and was expected to return quite a reasonable yield. The crop was awarded equal points with that of Mr. W. G. Rodda.

The Fallows.

Considering the peculiar extremes of seasonal conditions with which Wimmera farmers had to contend during 1939, the standard of the fallow exhibits at Warracknabeal was good. In this district many growers rely almost entirely on tractors for locomotive power and the speed and efficiency with which the fallows can be worked at the most appropriate time, are, no doubt, important factors in the maintenance of the high standard of fallowing in the district.

Delivering bulk wheat to a silo.

Discharging wheat from a country silo into bulk trucks.

Although it is widely recognized that the conservation of soil moisture by fallowing is of paramount importance in maintaining the production of high yielding wheat crops under Wimmera conditions, it is not always adequately realized that weed growth is by far the most important medium through which soil moisture escapes from the fallow. Through rigid control of weeds by the judicious use of implements and sheep, both moisture and plant food reserves in the fallow are protected.

Experience in cultivation trials carried out by the Department of Agriculture at the Longerenong Agricultural College has indicated that the use of good, early fallow is essential for maximum wheat yields. The summarized results of these experiments, in which fifteen different cultivation treatments are undertaken, are set out in the following table.

CULTIVATION TRIALS—LONGERENONG, 1927-1939.

Treatment.	*Wheat Yield bush./ac.*
Summer fallow (average of 4 plots)	36.6
Winter fallow (average of 3 plots)	35.8
Late fallow (October)	26.0
Sheeped winter fallow (no cultivation August till autumn) ..	22.8
Non-fallow — not ploughed till autumn	12.7

In these tests summer fallowing has given a slightly higher average yield than winter fallow, each type having shown to advantage in different years. On the other hand, late fallowing has given consistently lower yields than normal winter fallow. The results also demonstrate the advantages of adequate cultivation and show that the use of sheep alone during the spring and summer months is not sufficient preparation for strong Wimmera land.

The awards were as follow:—

AGGREGATE COMPETITION—FALLOW, 1939, AND CROP, 1940.

Heavy Land Section—100 acres of Fallow.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation and Seed-bed.	Total.
Maximum Points ..	25	25	25	25	100
R. O. Gould No. 1 ..	24	24	25	24	97
R. O. Gould No. 2 ..	24	24	25	14	97
R. R. King	25	24	24	23½	96½
S. J. King	24	24	24	24	96
O. P. Pietsch	24	24	24	24	96
R. McCollim and H. L. Martin	24	24	24	23½	95½
M. Landt	24	24	23	24	95
W. Landt	23	24	24	24	95
L. Landt	23	24	24	24	95
H. J. Bunge	24	24	23½	23½	95
W. Bunge	24	23	22½	23	92½
Mrs. B. A. Hewitt ..	24	23	22	23	92
H. W. Starick	24	23	22	23	92
E. Croser	23	23	21	23	90

With two excellent entries of equal merit, Mr. R. O. Gould was successful in the Heavy Land section. Although the No. 1 entry had received only three workings, being summer fallowed with the disc in March, scarified in July, and part scarified and part springtoothed in November, the fallow presented a finished appearance and evidence of thorough and careful cultivation. Weeds were practically absent and a nice even, cloddy mulch had been obtained. The No. 2 entry was worked with the disc in July, broken down with the harrows, scarified in August and finally springtoothed after the November rains.

Mr. R. R. King's entry consisted of two portions—70 acres and 30 acres respectively. It had been scarified in July, then harrowed later that month, scarified at the end of August, and in September cross-scarified. After the November rains part was scarified and part harrowed with shear points attached. Several of the other exhibits were of a very good standard and showed evidence of careful preparation in a difficult season.

Light Land Section—50 acres of Fallow.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation and Seed-bed.	Total.
Maximum Points ..	25	25	25	25	100
A. K. Hart	24	24½	25	24½	98
A. L. Milbourne No. 1 ..	24	24	24½	24½	97
A. L. Milbourne No. 2 ..	24	23½	24½	24½	96½
W. Altmann	24	24	24½	24	96½
W. G. Rodda	24	23½	25	23½	96
L. R. Rodda	24	24	25	23	96
H. T. Dart	24	24	24	24	96
L. B. Wurfel	24	24	23	23	94

A very even series of exhibits characterized the fallows in the Light Land section. First place was awarded to Mr. A. K. Hart, who had prepared a particularly good fallow. After being summer fallowed during the second week of April the paddock was scarified three times (in June, August and September) and then combined in November.

Mr. A. L. Milbourne also entered two excellent fallows. The No. 1 entry had been scarified early in January from a paddock which had been sown to oats and fed-off. Another scarifying was given in June and the springtooth was used for subsequent workings in September and November.

The fallow exhibited by Mr. W. Altmann was scarified during the first week of April, then worked again with the scarifier three times during June, July and September. After rain in November the paddock was springtoothed.

The remaining fallows in this section were of a high standard and reflected the efficient methods adopted in the district.

Victorian F.A.Q. Wheat

Analysis of 1940 Sample

By H. Shattock, M.Sc., A.A.C.I., Cereal Chemist

THE following is a report of the usual examination, analysis, and milling and baking tests conducted on a portion of the official F.A.Q. wheat sample, made available through the courtesy of the Chamber of Commerce. The appearance of this year's sample is good, most of the grain being plump and the amount of foreign material low. The bushel weight, struck at 63½ lb., is as high as has been attained previously, apart from the record value of 64½ lb. in 1939.

Wheat.

Analytical results on the wheat are given in Table I, those for some years past being included for comparison.

The screenings were almost free from weed seeds, and were composed mainly of cracked grain, with some coarse and fine husk and a little straw. The lower protein content of the wheat is not due to any changes of the varieties sown, but is occasioned by the small amount of sunshine during the ripening period, and by the rainfall, which through the season was higher than normal for most of the wheat-growing districts. Last year's sample was exceptionally high in protein, due to remarkably favourable seasonal conditions.

Flour.

The wheat, conditioned at 15 per cent. moisture, milled well on the experimental flour mill to give a good yield of clean, bright flour. Analytical data are given in Table II.

The gluten content is lower than the values for the past two years, but as judged by its feel during the washing-out process, is of quite good quality. The diastatic capacity or maltose

TABLE I.—ANALYTICAL RESULTS—WHEAT.

—	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.
Mositure (per cent.)	10·59	10·89	11·84	12·2	12·7	11·8	9·1	10·7
Impurities (screenings) (per cent.)	8·7	4·8	8·6	4·9	4·5	5·3	3·4	4·1
Ash (per cent.)	1·39	1·36	1·61	1·41	1·34	1·30	1·26	1·43
Protein (N x 5·7) per cent.)	9·35	9·53	10·93	9·74	9·80	11·09	12·81	9·78
Bushel weight (lb.)	62	60	60	63½	62	63½	64½	63½
Pelshenke figure (mins.)	..	24	24	26	24	28	36	26

TABLE II.—ANALYTICAL RESULTS—FLOUR.

—	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.
Moisture (per cent.)	..	..	..	..	..	..	11·1	12·6
Yield (per cent.)	73·2	72·8	71·7	73·6	71·3	73·8	71·3	72·9
Ash (per cent.)	0·49	0·51	0·56	0·48	0·50	0·48	0·54	0·48
Protein (N x 5·7) (per cent.)	8·02	8·79	9·39	9·00	9·12	9·92	11·17	8·78
Wet gluten (per cent.)	22·4	23·1	26·8	27·4	26·4	30·4	38·7	28·8
Dry gluten (per cent.)	7·6	7·9	9·1	9·1	8·4	9·9	12·2	9·5
Water absorption (hand) (per cent.)	50·6	50·6	50·6	50·0	50·25	50·6	50·0	50·2
Water absorption (farinograph) (per cent;)	..	..	..	..	..	54·5	63·0	57·4
Maltose figure	141	195	84	159	142	152	168	155

figure, while typical of Victorian wheat, is low, but this can be remedied by the correct blending of wheats in the grist, or by the addition of malt flour.

The farinograph diagram indicates a short mixing time, but reasonably good fermentation tolerance and the elasticity is slightly better than last year. The volumes of the loaves obtained in the experimental baking tests are only slightly lower than last year, showing that though the gluten content of the flour is low, it is of good quality. The results with "pup" loaves are given in the following table.

BAKING TESTS (100 GRM. FLOUR).

Procedure.	Loaf Volume in c.c.			
	1937.	1938.	1939.	1940.
Basic	395	450	397	392
Basic + malt + phosphate	440	510	475	460
Basic + malt + phosphate + bromate	385	490	517	497

The basic loaf had a poor external appearance, but good, even texture. The loaf with malt and phosphate had fair external appearance, but rather poor honeycomb texture. The addition of bromate produced a marked improvement, the loaf having a good external appearance and satisfactory texture. The crust colour of the loaves was rather pale, but the colour of the crumb was quite good. These baking tests indicate that this season's flour will improve with age and that mineral improvers, as well as yeast foods, will be necessary for best results.

The flour was also baked using a commercial formula. Dough equivalent to 100 grm. flour was scaled off at half-hour intervals, for two hours and prooved to constant height, time of proof varying from 50 to 60 minutes. The four loaves were all satisfactory and the volumes were almost identical. The last loaf, though showing signs of being overwrought, was the best of the series. The flour will not take quite as much work as last season, but the results show that it has good fermentation tolerance and, if treated correctly, should produce a very satisfactory loaf.

Normal yields of bran and pollard were obtained, but with lower protein content than was the case last year, as would be expected from the protein content of the wheat this season.

"Bacchus Marsh" Subterranean Clover

(Continued from page 109.)

of season of growth. If Bacchus Marsh is described as an early strain, Dwalganup is, by comparison, a first early or very early strain. Bacchus Marsh should not therefore be expected to succeed under quite such short season conditions as will Dwalganup. It is, however, so much superior in potential productivity as to make it the wisest choice for areas which are just too dry for Mt. Barker to give complete success.

Seed is being harvested by Messrs. G. C. and A. W. Toose, of Smeaton. The seed is being certified by the Victorian Department of Agriculture, and may be obtained either direct from the growers, or from the usual commercial sources.

A prolific green manure crop (lupins) in a Croydon Orchard.

Orchard Green Manuring

Results of Tests

By G. W. Gayford, B.Agr.Sc., Assistant Horticultural Research Officer.

FOR the past three years it has been the practice on apple and pear demonstration plots throughout the State to sow green crops in the autumn. These crops are sown as a complementary practice to the spreading of artificial fertilizers in connexion with the trials, to improve soil fertility, which are conducted on various orchard properties in each district. Funds for this work are provided by a grant from the Commonwealth Government. So far the results obtained from these attempts at green manuring have been variable. With the exception of last year the seasons have definitely been against the successful establishment of green crops. Another factor has been the low natural soil fertility on some of the orchards. This has probably been due to the depletion of humus by a long period of clean cultivation without an adequate manurial programme to increase surface soil fertility and to encourage weed growth.

Last year, an early autumn break in the weather resulted in good soil moisture conditions which favoured the germination of green crops. The winter, however, was one of the wettest on record (Melbourne had 33.11 inches of rain in 1939. The average rainfall is 25.6 inches). On several properties the leaching and waterlogging was such that in spite of a satisfactory germination, the crops died. Even underground, tile-drained orchards suffered. In the following report the observations made on the crops sown last year is given briefly so that growers who intend sowing crops for green manure may benefit by these experiences. Because green manure crops sown in previous years were not entirely satisfactory, trials on a restricted scale were conducted in an attempt to improve the bulk of growth.

Tick beans were sown on plots in the northern pear-growing areas. As a trial, lands were sown at double the normal rate of seeding. On all other plots, peas and barley were grown. Treatments included sowing at double the normal rate, applications of sulphate of ammonia in addition to superphosphate with the

seed, the addition of ground limestone and applications of sulphate of ammonia and superphosphate to uncropped lands to stimulate the natural weed growth.

The normal rates of seeding were as follow :—

Beans	1½ bushel per acre
Peas	¾ bushel per acre
Barley	½ bushel per acre
Super. (with crop)	2 cwt. per acre
Super. (top-dressed)	3 cwt. per acre
Sulphate of ammonia (with crop) ..	2 cwt. per acre
Sulphate of ammonia (top-dressed) ..	1 to 4 cwt. per acre
Ground limestone ..	2 tons per acre

Batesford (Geelong District).

The Batesford plot is situated on an alluvial flat of the Moorabool river and the soil is a deep black alluvium derived from the surrounding basalt, lime and sandstone country. The whole orchard has received liberal dressings of farmyard manure from time to time. The natural soil fertility seems to be high on this property, and consequently it has not been difficult to establish green crops.

The crop of peas and barley combined was sown on 12th April. The peas failed because of excess water, but an excellent stand of barley was obtained. The land sown with super. only, provided as much bulk of crop as those on which lime or sulphate of ammonia had been applied, but both these treatments produced crops with foliage of a deeper, healthier green. Apparently the soil was both slightly acid and deficient in nitrogen, but the extra treatments were not required to secure sufficient bulk of crop. The land sown at double the rate of seeding did not show any greatly increased bulk over those sown at the normal rate.

A strong weed growth occurs naturally throughout the whole of the orchard, but it was noticeably better both where sulphate of ammonia had been applied and where a green crop had been ploughed under in the previous year.

Red Hill and Tyabb.

The plot at Red Hill is on a red clay loam soil derived from older basalt. Two plots at Tyabb are on sandy loam soils. Peas and barley were sown on these plots on 1st April. The crops generally were poor, the wet season being the limiting factor apparently, as applications neither of lime nor sulphate of ammonia produced an appreciable effect on the crop.

Sowing the crop at double the normal rates, both at Red Hill and Tyabb, resulted in a growth of peas and barley double that on lands sown at ordinary rates. It would appear that the normal rate of sowing is insufficient on these soils.

Applications of sulphate of ammonia to uncropped lands produced a healthy growth of capeweed on all plots. The growth of weeds and crop in the vicinity of manurial plots receiving sulphate of ammonia or complete fertilizer (2:2:1) as a spring application was more vigorous than check plots (no manure) and is indicative of the effect of this manurial treatment on the surface soil (Fig. 1).

East Burwood.

The soil on the East Burwood property is a silurian grey clay loam. The peas and barley, sown on the 17th March, germinated and grew well for a few weeks, but later the peas rotted at ground level as did also the rank growth of capeweed. The situation is flat, and

Fig. 1a.— Showing growth of capeweed obtained adjacent to trees receiving spring applications of complete ferlilizer.

Fig. 1b.—Showing poor growth obtained on plot receiving no manure.

consequently the crop was waterlogged during the winter. The foliage of the barley became yellow, and the crop failed to mature.

Pakenham Upper.

The soil at Pakenham Upper is a grey granitic sand. The peas and barley sown on 13th March under excellent soil moisture conditions germinated well. However, on this property leaching seemed to be the limiting factor, and although applications of lime and sulphate of ammonia produced better growth early in the year, the crop later became yellow and growth ceased. The natural weed growth on this property was very poor, and suggests that soil fertility is naturally low.

Some attempt to increase the humus content of the soil by applications of an organic manure such as dried blood is required on this soil. This will be included in the trials this year.

Croydon.

The soil in the Croydon area is a grey silurian silty loam. Conditions at the time of sowing on 10th March could not have been more favorable on this plot, and an excellent germination of peas and barley resulted. For the first two months one land treated with sulphate of ammonia and another sown at double rates were definitely more vigorous than other untreated lands, but as the winter progressed the growth became more sickly in appearance and did not exceed 12 inches in height in September.

On the adjacent pear block, better growth was obtained and, where lime was applied, about twice the bulk of greenstuff was obtained. The application of sulphate of ammonia to an uncropped land did not appear to have noticeable effect on growth of weeds. The weed growth (capeweed) was quite good throughout the rest of the orchard.

Because the growth on the pear block was so much better than that on the apple block, surface soil samples were obtained in August for analysis to compare these areas. Each sample is a composite from eight 6-in. bores.

Sample A was obtained from the Jonathan fertilizer block, which carried a poor cover crop. Light-grey silty loam to silt.

Sample B was obtained from the pear fertilizer block, which also carried a poor cover crop. Grey silty loam.

Sample C was obtained from the pear fertilizer block, which had been limed at the rate of 2 tons ground limestone per acre. On this area a satisfactory cover crop had been established.

The chemical analyses of the Croydon samples (in parts per 100,000) are set out in the accompanying table:—

—	Sample "A."	Sample "B."	Sample "C."
Nitrogen	104	143	143
Phosphoric acid	33	42	47
Potash	67	107	96
Lime	78	82	170
Nitrate nitrogen (parts per million)	·5	·8	·7
pH	5·4	5·2	5·7

The samples are low in phosphate, potash and lime. Application of lime lowered the acidity and doubled the lime content. Nitrate figures are particularly low due to the cold, wet conditions and leaching.

Doncaster.

The soil at Doncaster is a rubbly grey silty loam. The crop was sown on 15th March and good germination was obtained. The growth which followed was of a green and healthy colour, and in the spring an ample bulk of material 3 feet in height was ploughed under. One land was sown at double rate, one was limed, and another was top-dressed with sulphate of ammonia, but these treatments showed no outstanding superiority over other untreated lands. The reason for this is due to the fact that the owner of this property has built up the soil fertility over a period of years by regular applications of organic and artificial fertilizers. Where soil fertility is of such a standard it is not necessary to go beyond the usual treatment to secure a good growth of green crop.

Strathewen.

The soil in the plot at Strathewen is a grey alluvial silt. The seed was sown on 20th March and a normal growth of barley was obtained, but the wetness of the situation caused the peas to rot. The growth of barley was sufficient to provide an excellent growth of greenstuff for ploughing under. Approximately twice the growth was obtained on a

Fig. 2a.—A crop of barley at Strathewen on land which has received ground limestone (2 tons per acre).

Fig. 2b.—Showing poor growth on land which has not received lime.

land into which lime at the rate of 2 tons per acre had been ploughed with the seed (Fig. 2).

A soil analysis was made after the crop had been ploughed under. Each sample is a composite from six 6-in. bores.

Sample A—land on which a good crop of barley was obtained by application of 2 tons ground limestone per acre.

Sample B—from adjacent land, unlimed, medium growth. The results obtained are as follow:—

—	Sample "A."	Sample "B."
Moisture (per cent.)	19·20	19·65
Lime (CaO) parts per 100,000 on dry basis	407	137
Nitrate nitrogen p.p. mil. ..	2·5	1·7
pH value	6·1	5·2

The acidity has been reduced by liming. The nitrate level is slightly better on the limed soil, probably because of the greater bulk of greenstuff which was ploughed under, and the fact that nitrification is favoured by liming.

Quantong.

The seed of the green manure crop was sown on 23rd March on light-brown sandy soil. A good crop was obtained with normal rate of sowing, but the peas were definitely better than the barley in the amount of growth produced. The application of sulphate of ammonia and sowing at double rates produced noticeably better results. The crop sown with the additional application of sulphate of ammonia was taller and greener than that sown with superphosphate only. Sulphate of ammonia broadcast on an uncropped land produced an excellent growth of weeds (capeweed, &c.), but superphosphate alone produced little difference in weed growth.

Pomonal.

The crop at Pomonal was sown on 23rd March on a very light sandy soil. A satisfactory growth was obtained, but it appeared to be suffering from nitrogen deficiency.

The peas again produced a bulkier growth than did the barley.

Amphitheatre.

The crop was sown on 23rd March on a grey sandy loam. An excellent growth of crop was obtained here. Double rate of sowing resulted in a greater bulk of greenstuff, and the application of sulphate of ammonia produced a greener, bulkier crop than lands sown with superphosphate only.

Strathfieldsaye.

The crop at Strathfieldsaye was sown on 20th March on red silty loam. Barley outgrew the peas where sulphate of ammonia was applied. On the remainder of the plot where superphosphate was the only fertilizer applied, fairly good growth was obtained.

Harcourt.

The growth of peas and barley at Harcourt was not satisfactory, despite the fact that they were sown under good conditions on 20th March. The light sandy soil of granitic origin is particularly susceptible to surface leaching and this, together with the low organic content of the soil after long periods of clean cultivation, has resulted in a low state of fertility.

The experience of growers in this district is that applications of blood and bone manure have resulted in an excellent natural growth of clover. Nitrogen in this more slowly available form, may suffer less from leaching and it is proposed to include this fertilizer in future investigations in this area.

Goulburn Valley Plots.

The soil of the Goulburn Valley plots is a typical red clay loam. The tick beans were sown on 31st March. The wet conditions caused some patches of crop to become waterlogged, and growth was poor early in the winter. Later, however, when the soil commenced to dry out, growth was better, and just prior to ploughing under an excellent growth of crop over 4 feet in height was obtained, (Fig. 3).

At Shepparton, adjacent to the cover-crop plot, a thick growth of trefoil had been obtained by heavy dressings of superphosphate in the autumn. This growth was evident on other orchards where superphosphate had been applied and the land ploughed early in the autumn.

Bamawm.

At Bamawm, the beans were sown on 20th March under suitable soil conditions, germination was satisfactory, and good growth was made throughout the season. A row sown at double the rate of seeding gave one and a half times the bulk of other rows but, as the average height for all the rows in the block was 5 feet, the heavier sowing did not appear to be justified under these conditions.

Fig. 4.—Capeweed growing at Tyabb on land unploughed except for drainage furrow.

Composite soil samples were obtained after ploughing from cropped and uncropped lands at Bamawm and Shepparton. Each sample was obtained from six 6-in. bores.

The results of the analysis are set out below—

A. Shepparton.—Tick beans ploughed under six weeks before sampling.

B. Shepparton.—Adjacent uncropped land.

C. Bamawm.—Tick beans ploughed under nine weeks before sampling.

D. Bamawm.—Adjacent uncropped land.

——	Sample "A."	Sample "B."	Sample "C."	Sample "D."
Moisture (per cent.)	13·2	12·4	10·85	11·4
Nitrate nitrogen (parts per million) on dry basis	2·9	·7	12·8	3·6

Fig. 3.—A vigorous growth of tick beans at Lancaster.

It is obvious, of course, that to obtain detailed information on the nitrate status of the soil after-cropping, regular sampling at greater depths would be necessary, but the figures shown above are interesting in that they do indicate an increase in nitrates in the surface soil following the ploughing under of crops.

Costs.

In order to compare the cost of the various plants used for green manure the following table has been drawn up. The costs are for seed and fertilizers only, at

present rates. Cost of cultivation may be taken as approximately 1¼d. per tree:—

Plant.	Bushels per Acre.	Fertilizer.	Cwt. per Acre.	Cost per Acre.	Cost per Tree.
				s. d.	d.
Tick Beans ..	1½	Super. ..	2	24 9	3
Field Peas ..	1½	Super. ..	2	18 9	2½
Peas ..	½	Super. ..	2	15 10	1·8
Barley ..	½				
Peas ..	½	Super. ..	2		
Barley ..	½	Sulphate of Ammonia	2	30 10	3½
Tares ..	½	Super. ..	2	17 3	2
Barley ..	½				
Natural Herbage	..	Super. ..	3	11 3	1¼
„ „	..	Sulphate of Ammonia	1	15 0	1½
„ „	..	„ „	2	30 0	3½
„ „	..	„ „	3	45 0	5
„ „	..	„ „	4	60 0	6½

Summary.

Although cover crops were successfully established on some of the demonstration plots last year, in several districts the abnormally wet winter caused leaching of the soil and waterlogging, and so prevented the healthy growth of crops.

Peas and barley combined, gave satisfactory results in southern districts where soil conditions were not too wet. The peas died out where the soils remained waterlogged for long periods. Tick beans provided satisfactory growth on northern pear plots.

The application of both lime and sulphate of ammonia produced noticeably better growth in a number of instances. In other cases the growth, although benefiting by such treatment early in the season, became poor later because of excess soil water. Where natural fertility was high, e.g., at Batesford and Doncaster, although the normal rate of seeding and application of sulphate of ammonia did cause slightly increased growth, such treatment did not appear to be warranted. However, where growth was rather poor, in order to obtain a crop of sufficient bulk it appeared advantageous to increase the rate of seeding.

Applications of sulphate of ammonia caused increased growth of weeds. Only in the Goulburn Valley did applications of superphosphate stimulate natural weed growth.

Soil analyses made at Croydon and Strathewen revealed low nitrates and low lime content. The lime application appreciably increased the lime content of the soil, reduced the acidity (pH determinations at Croydon and Strathewen revealed acid reactions on untreated soil) and resulted in a better growth of crop.

Soil analyses taken at Shepparton and Bamawm show that green manuring increased the nitrate content of the soil. This agrees with the work done by West and Howard, at Griffith ("Some Effects of Green Manuring on Citrus Trees and on the Soil." West and Howard, Bull. 120, C.S.I.R., 1938).

Recommendations.

Sow crops as early as possible and irrigate if necessary. The system of cropping alternate lands allows the fruit to be harvested after the crop has been sown without much damage by pickers, vehicles, &c. An adequate growth is then assured before the winter.

If the natural growth on an orchard is poor and it has been difficult to establish green crops, liming and an application of a nitrogenous fertilizer may be necessary. Lime is not a fertilizer in itself, but it produces in the soil those conditions most favorable to the liberation of available plant nutrients. The effects of such treatment last for a number of years and, therefore, depending on the rate of application, any one part of the orchard need not receive lime more frequently than every three to four years.

Where soil fertility is low it may be necessary to increase the rate of seeding, otherwise the rates mentioned early in the report should be sufficient.

Growers who do not intend to grow green crops should forego the autumn ploughing, except for a drainage furrow, and encourage the natural herbage (Fig. 4). On some poor soils, applications of fertilizers will be necessary to obtain a good bulk of greenstuff. Sulphate of ammonia at the rate of 2 cwt. per acre has been found most satisfactory in this regard, except in the Goulburn Valley, where applications of superphosphate early in the autumn are followed by a useful growth of clover.

Tick beans, and peas and barley only are dealt with in this report. Other plants such as lupins, rape, oats, tares, and rye corn may also be used with good results.

Acknowledgment.

The soil analyses mentioned in this report were made by the Agricultural Research Chemist.

Zinc Requirement of Wheat

The Effect of Superphosphate

By C. R. Millikan, M.Agr.Sc., Plant Pathologist.

FROM observations on the effect of zinc sulphate in promoting an improvement in the growth of cereals on Wimmera black soil, it is apparent that this material must be applied in conjunction with superphosphate to produce the marked responses described in a previous report (2), as to date very little difference in growth has been noted where zinc sulphate has been applied alone. It would seem therefore, that applications of superphosphate were a pre-disposing factor to the zinc response of the plant, which fact would further point to a relation between the zinc and phosphorus concentrations in the plant.

To determine if such a relationship existed under field conditions in the Wimmera black soils, samples of Ghurka wheat plants were obtained, six weeks after germination, from experiments sown on fallow and on wheat stubble at Nhill during 1939.

The treatments studied were as follow:—

On Fallow.—Untreated, Superphosphate 1 cwt. per acre, Superphosphate 1 cwt. + Zinc Sulphate, 10 lb. per acre.

On Stubble.—Untreated, Superphosphate 1 cwt. per acre, Superphosptate 1 cwt. + Zinc Sulphate, 40 lb. per acre.

The sites of these experiments were adjacent, and were comparable except for their previous cultivation.

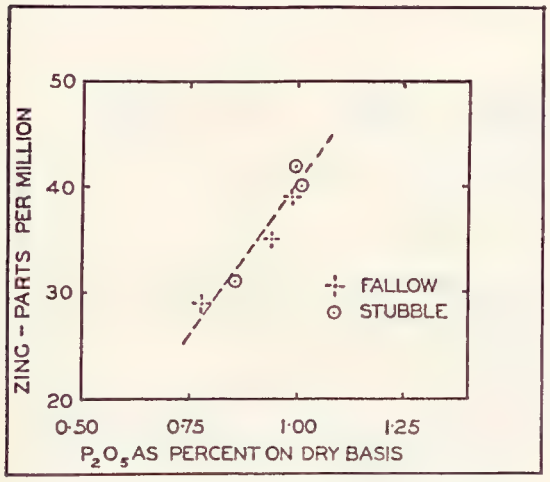
The plant samples from the above treatments were analyzed by the Agricultural Research Chemist. The results of the analyses are shown in Table I.

It will be noted firstly from Table I. that the wheat plants grown on wheat stubble had a higher concentration of phosphoric acid and zinc than did those grown on fallow. This result probably has an important bearing on the fact that little or no response to zinc applications has been obtained to date in wheat or oats grown on black stubble soil in the Wimmera. Wark (1939) has also found that the phosphate content of wheat was higher in a stubble than in a fallow crop, a result which he attributes to the higher nitrogen supply available to the fallow crop.

It will be further seen from Table I. that the application of superphosphate in the field not only increased the phosphoric acid content in the plant, but also its zinc concentration. A direct relationship between the phosphoric acid and zinc concentrations in the plants from the two experiments existed. (Fig. 1).

TABLE I.—RESULTS OF ANALYSES AS PER CENT. ON DRY BASIS, OF GHURKA WHEAT PLANTS GROWN ON BLACK FALLOW AND WHEAT STUBBLE SOILS AT NHILL DURING 1939. SAMPLES OBTAINED SIX WEEKS AFTER GERMINATION.

	Fallow.			Wheat Stubble.		
	Untreated.	Super. 1 cwt.	Super. 1 cwt., Zinc sulph. 10 lb. per acre.	Untreated.	Super. 1 cwt.	Super. 1 cwt. Zinc. sulph. 40 lb. per acre.
Crude Ash	14·18	13·36	14·31	13·35	14·08	14·01
Silica (SiO_2)	4·53	3·74	4·47	4·08	4·08	4·30
Silica Free Ash	9·65	9·62	9·84	9·27	10·00	9·71
Phosphoric Acid (P_2O_5)	0·78	0·94	0·98	0·86	1·01	0·99
Potash (K_2O)	4·47	4·64	4·48	4·46	4·56	4·41
Lime (CaO)	0·77	0·79	0·80	0·72	0·79	0·75
Zinc (Zn.) parts per million	29	35	39	31	40	42
Manganese (Mn.) parts per million	100	118	101	98	96	98



Showing the relation between the phosphoric acid and zinc concentrations of wheat plants grown in Wimmera black soil.

From the results it is evident that the application of superphosphate to Wimmera black soil increased the zinc requirement of the plant. It would therefore be more responsive to zinc applications, particularly if the amount of available zinc in the soil were limited.

These results therefore afford a partial explanation of the occurrence of zinc responsiveness in plants grown on Wimmera black soil treated with superphosphate, which treatment may be regarded as a predisposing factor to such response.

Support for this finding is afforded by the observations of West (1938) that zinc-cured mottle leaf of citrus occurred in the superphosphate plots of the fertilizer field at the Commonwealth Research Station, Griffiths, New South Wales, being apparently induced by the phosphate ion. Further, Chapman et al (1937) found that mottle leaf symptoms in their cultures deficient in zinc were accentuated by increased phosphate concentrations.

References.

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2. Millikan, C. R., 1938.—A Preliminary Note on the Relation of Zinc to Disease in Cereals. Jour. Dept. Ag. Vic. 36 : 409-416.
3. Wark, D. C., 1939.—Tests on Plant Tissue as a Guide to the Soil's Available Nutrients. Jour. Aust. Inst. Agric. Sci. 5 : 224-227.
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Questions and Answers

The following question has been received from a correspondent and it is considered that the reply will be of general interest to fruit growers.

QUESTION.—Can Bordeaux mixture, zinc and white oil emulsion be combined in one spray for the control of septoria and sooty mould, mottle-leaf and scale insects of citrus?

ANSWER.—This combination of sprays is possible, and quite compatible provided that sufficient lime is employed in the spray mixture to prevent the acid sulphate radicle from causing the oil emulsion to break.

The formula recommended is—

White oil emulsion	2½ gallons in 100
Bordeaux mixture	6.6.100
Zinc-lime ..	5.2½.100

The Bordeaux mixture should be made first in the vat with approximately 50 gallons of water. Two and a half gallons of white oil emulsion should be mixed with water and added to the vat while the agitator is running. The zinc-lime spray is then made in a separate container and poured into the vat, and the vat filled up to 100 gallons.

The quantities of spray mentioned above are—Bordeaux mixture, made of 6 lb. of bluestone and 6 lb. of freshly-slaked lime; the zinc-lime spray, 5 lb. of zinc sulphate and 2½ lb. of freshly-slaked lime.

The usual strength of the zinc-lime spray when used alone is 10.5.100, but as this spray is used to supply only a minor element deficiency, the reduced strength of 5.2½.100 will be found quite effective for trees which are not badly affected by mottle-leaf. The best time to apply this spray is during February and March, but it can also be used in September.

To obtain effective control of the scale insect, it is necessary for the application to be very thorough, and sufficient spray per tree should be used to thoroughly wet all parts, including the under-side of the leaves. The usual precautions regarding fumigation after Bordeaux mixture spraying should be adhered to, and this operation should not be carried out within a period of from four to six months.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

NOW that the autumn flowering plants are at their best, it is a good time to select and make a note of any that you would like to have next autumn. Unless the name is taken, it is very often forgotten by the time the next planting season arrives.

Make further sowing of calendula, winter flowering stocks, pansy, viola, cineraria, primula malacoides and antirrhinum, and plant them out as soon as they can be conveniently handled. Plant out such bulbous plants as ranunculus, anemone, daffodil, hyacinth, freezia, tulip and bearded iris.

The autumn is a good time to establish a lawn with the fine types of grasses. The area should be well prepared throughout the previous summer to encourage any weed seeds to germinate so that as many weeds as possible may be destroyed before the lawn seed is sown. Planting a crop of potatoes or peas or such like is sometimes advocated, but the actual crop grown is not so important as keeping the area worked between the plants to destroy any weeds that may germinate.

The area should be well worked up this month, and the surface broken down finely in preparation for sowing the seed after the first autumn rains. If the area is not moist enough, give it a good watering before sowing. The seed to sow depends upon the purpose for which the lawn is required and the amount of attention it is likely to receive. It is seldom recommended to plant any one species of fine grass, because it is very difficult to keep a lawn pure for one species.

It is advisable to sow a mixture of two or more different types. Eventually the one most suited to the particular environmental condition will predominate. A description of some of the lawn grasses most commonly used is set out below.

Drylands Brown Top: Agrostis tenuis.—This is one of the finest of the bent grasses, but it is not a creeping variety. It gives a beautiful fine turf of a dark-green colour.

Chewing's Fescue: Festuca rubra, variety fallax.—This is a very popular lawn grass, and makes a beautiful fine-leaved lawn. Care must be taken to obtain fresh seed as the germination rapidly deteriorates. A mixture of brown top and Chewing's fescue makes a very fine attractive lawn, and is largely used on golf greens in southern Victoria. This lawn needs careful attention in regard to weeds, water and fertilizers, and one's efforts in attending to these operations will be reflected in the condition of the lawn.

Creeping Bent: Agrostis stolonifera, variety compacta.—This has fine creeping stems, and in the cooler parts of the State it is very useful and better than couch grass.

Kentucky Blue: Poa pratense.—This is a hardy type of grass and does well on the lighter soils. It has underground stems, and although somewhat similar in appearance to English rye-grass, it is hardier and persists much better.

English Rye-grass: Lolium perenne.—This is a very quick grower, and to obtain a lawn quickly, but of a second class nature, this grass is very useful. It is satisfactory for back yard lawns.

Special mixtures may be obtained, but it is usually better to purchase the different varieties of grass seed separately and do the mixing yourself. By this means, it is known definitely what seed is being sown. The amount of seed to sow depends on the size of the seed in the mixture, e.g., bent grasses have very small seeds and about ½ to ¾ oz. per square yard is sufficient, whereas larger seeded species, such as English rye-grass would require to be sown at the rate of about 2 oz. per square yard.

For a very fine lawn, a mixture of two parts Chewing's fescue, and one part brown top, sown at the rate of 1 oz. per square yard, would be satisfactory, if the lawn is going to be carefully tended and the district is not too hot. Three parts Chewing's fescue, one part creeping bent, one part Kentucky blue, makes a fine lawn that is hardier than the former. This also should be sown at the rate of about 1 oz. per square yard. A lawn which does not require as much attention as that made from the very fine grasses can be established with five parts English rye-grass, one part creeping bent, two parts Kentucky blue, and two parts Chewing's fescue. This mixture should be sown at the rate of about 1½ oz. per square yard. Before sowing, divide the seed into two equal parts, sowing one lot over the whole area, and the other portion over the same area but at right angles to the first sowing. By this means, a more even spread is obtained than if the seed is all sown the one way.

After sowing, scatter a very light dressing of sandy soil over the seed, but if that is not available, rake the soil over very carefully, so as to partially cover the seeds. If the soil is inclined to become dry, water it with a very fine sprinkler, taking care not to disturb the young plants. Let it grow about 3 or 4 inches high before cutting, and it is better cut with a scythe the first time, but if that is not convenient, use a good sharp mower, so that it will not pull out the young seedlings. In the northern areas, these fine grasses do not withstand the hot summer, and it is advisable to grow couch, buffalo, or kikuyu grass. These are planted about October or November and by the vegetative portions. Whichever species of grass is selected, the very important factor to remember is thorough preparation before sowing.

Vegetable Growing.

The mild summer was not very satisfactory in regard to tomatoes, cucumbers, and French beans, and they have been slow in maturing. The tomatoes have had coarse skins and too much greenish core.

March is the time to sow seeds of broad bean, beetroot, carrot, cabbage, lettuce, turnip, white onion and parsnip. Plant out the cabbage and lettuce when they are large enough to be transplanted.

For culinary purposes, the white onion is very useful during the winter months. They are said to have special medicinal value, and they are included in a number of cooked foods as well as salads. The silverskin or white varieties should be sown this month and the ground, into which they are going to be transplanted, prepared next month. If more convenient, they may be sown in open rows where they are to grow. If so, thin out and transplant those thinned out, or if not required for that purpose, they may be used for soups, salads, &c.

Onions do best in rich friable soils, but the early varieties may be grown in the lighter soils. Sow the seed in rows 12 inches apart, and eventually thin out the onions in the rows to about 4 to 5 inches between the plants.

Among the white varieties, Silverskin and Early White Queen are two popular sorts. They are essentially winter types and do not keep well after ripening. The brown types, of which Brown Spanish is the most popular, should not be sown yet, or they will tend to run to seed prematurely. Sow Brown Spanish in May. When ripe, these may be harvested, and they keep very well.

Another type which has gained popularity in recent years is the odourless onion. This is a white variety which is a much better keeper than the usual silverskin. It has a delicate flavour, even when compared with the other silverskins, and may be eaten either cooked or raw.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

FURTHER investigations on the establishment of cover-crops in Victorian orchards have confirmed the belief, which has frequently been expressed before, that many of our orchard soils are of low fertility. The wet winter and spring experienced last year served only to accentuate this problem. Leaching of plant foods from the lighter soil types was very pronounced, and nitrate investigations in the surface soil showed that the nitrate content was very low even after the warm weather had commenced. One of the main reasons for this excessive leaching and very low nitrate nitrogen content of many of our orchard soils is that they are particularly deficient in humus.

The grower has at his disposal two methods of feeding his orchard trees. He may apply complete fertilizers in an effort to directly feed the tree, or he may endeavour to so improve his general soil fertility by good cultural practices that the plant foods in the soil will become available. This second method, of course, will not be of any value where analysis shows that serious deficiencies of the main plant foods exist. Many of our lighter soil types have an acid reaction. In some cases the pH value is as low as 5.2, eg., Croydon. In a soil which is very acid and which is liable to excessive leaching, lime is generally very low. On soils of this type, applications of ground limestone, up to the rate of 2 tons per acre, can be made, and the best time to apply this material is after the autumn ploughing. It should be spread on the surface of the soil.

The direct effects of lime are very readily seen by orchardists. Although there may be sufficient lime to maintain a good soil tilth and to encourage the growth of desirable natural herbage and leguminous cover-crops, an application of 2 tons of ground limestone per acre will decrease the acidity of some soils, e.g., Croydon, from a pH of 5.2 to 5.7 (a neutral soil, i.e., one that is neither acid nor alkaline, has a pH of 7.0).

At Strathewen the same application altered the pH of the surface soil from 5.2 to 6.1. On soils of this type, it is generally found that an improvement in the reaction of the soil is accompanied by increases in the nitrate nitrogen content.

A good practice in liming the orchard is to apply the lime to alternate lands and to cover-crop the other lands and encourage growth of green manures by applications of sulphate of ammonia and superphosphate at the rate of 2 cwt. of the former and 1 cwt. of the latter per acre. Some orchardists, after having failed to obtain a satisfactory growth of leguminous cover-crops, discontinue green manuring. A much better practice would be to sow other cover-crops such as barley, rye, oats, or rape. After several seasons of good cover-cropping with these crops, prospects of establishing leguminous cover-crops will improve. Many orchardists with a reasonably fertile soil, by the liberal application of superphosphate, have been able to establish a very strong growth of clovers and trefoils. To establish these plants on the less fertile soils, it is necessary to include nitrates in addition to the superphosphates. Any attempts at soil improvement should be undertaken early in the autumn, not later than early March.

In Goulburn Valley soils, subsoiling with three cuts down the centre of the lands has improved the water penetration by breaking up the hard-pan structure, and a better growth of cover-crops has resulted. Such a practice, however, must be carried out with extreme care in pear orchards, because of the tendency of these trees to sucker after the root systems are interfered with.

March is a particularly good month to bud citrus trees which were prepared for re-working last spring. Apart from the changing of varieties, citrus growers are advised to pay particular attention to the re-working of "dry-type" Thompson Navel oranges and "off-type" Washington Navel and Valencia oranges. Although the regulation concerning juice content states that the orange must contain at least 30 per cent. of juice by weight, an orange with this minimum quantity of juice would be classed as fairly dry. Growers who desire information on the preparation of trees for re-working and, also, details of the budding operation, may obtain a free leaflet on application to the Director, Department of Agriculture, Melbourne, C.2.

Book Review

"Rural Water Supply and Engineering," by Forest B. Wright.—(Chapman and Hall, Ltd., London, 12/6. John Wiley and Sons, Inc., New York.)

An excellent book for students of Agriculture, setting out clearly the elementary problems likely to be met with in practical water supply and sanitary engineering on the farm.

Written in U.S.A. for American conditions the type problems are based on the American gallon as the unit volume of water, and adjustments are therefore necessary to suit British conditions. No specific mention is made of this fact, and it is suggested that in future editions a note be made of it.

K. C. Simmons.

Insect Pests of Tomatoes

Control Measures

By R. T. M. Pescott, M.Agr.Sc., F.R.E.S., Entomologist.

IN Victoria, there are numerous insects which attack the tomato crop, both plants and fruits being damaged. While the major damage results to the crop grown in the open, a certain amount of damage occurs to tomatoes grown in the glasshouse.

Certain of the insects that may be present are familiar to the majority of growers, but there are others less frequently met with, which may, on occasions, be just as severe in their attack. It is the purpose of this article to present, in as simple a form as possible, some information with regard to the habits of these pests and the methods to be used for their control.

The following key will, it is hoped, enable growers to make a ready identification of the particular insect present in the tomato crop:—

Tomatoes Grown in the Open.

INSECTS ATTACKING THE PLANTS.

A. Plants cut off at ground level, particularly when young, grubs just under surface of soil during day	**Cutworms.**
B. Plants cut off at ground level when more mature, or foliage cut off ..	**Vegetable Weevil.**
C. Stems of young plants become blackened and shrivelled, leaves wilt, plants die rapidly, grubs boring into stems ..	**Stem Caterpillar.**
D. Foliage eaten, but network of veins of leaves remaining	**Leaf Eating Ladybird.**
E. Sap sucked from foliage, causing yellowing and wilting	**Green Vegetable Bug and Rutherglen Bug.**
F. Sap sucked from blossoms, fruit setting affected ..	**Thrips.**

INSECTS ATTACKING THE FRUIT.

A. Fruit spotted, spots not ripening, but remaining tough and leathery ..	**Green Vegetable Bug.**
B. Fruit attacked by caterpillars, gouging out large holes	**Tomato Moth.**
C. Small whitish maggots present in holes produced by (B)	**Metallic Tomato Fly.**

Tomatoes Grown in the Glasshouse.

A. Stems bronzy and leaves silvery	**Tomato Mite.**
B. Foliage wilting, abundant production of sticky liquid, white insects on underside of leaves ..	**White Fly.**
C. Foliage wilting, production of sticky liquid on leaves, green insects on undersurface of leaves ..	**Aphids.**
D. Blossoms attacked, and fruit setting affected ..	**Thrips.**

Cutworms.

In certain seasons, and particularly with conditions similar to those which existed in the spring of 1938, cutworms (family *Noctuidae*) are responsible for severe losses to summer crops; potatoes and tomatoes being commonly attacked. They are pests of world-wide importance, and, in Victoria, numerous species may be present.

NATURE OF INJURY.

Cutworms are general feeders and their caterpillars feed upon anything green and succulent. With tomatoes, the young plants are attacked soon after planting out, the stems being cut off at ground level, causing the plants to topple over, hence the name "cutworm." Later, when the plants are older and thicker stemmed, the caterpillars may succeed in only gnawing the stems and destroying the foliage. Cutworms are nocturnal in habit, hiding in the soil at the base of the plant during the day, and feeding at night. This will explain why the actual destruction of the plant is rarely observed by the grower.

Fig. 1.—Typical cutworm larvae. (Enlarged.) During the day they may be found coiled up in the soil, as shown in the lower illustration.

Life History.

Cutworm caterpillars are the larvae or grubs of night-flying moths, which usually are found flying early in spring. These moths lay their eggs chiefly on moist soil under weeds and grasses, but, in some cases, on the foliage of the plant itself. After a short incubation period, the eggs hatch into small cutworms which feed, at first, on the young growths of any plant present. They shelter in the soil just under the surface of the ground during the day, coming up to feed at night.

After four to six weeks of feeding, during which time they moult or shed their skins some five or six times as they increase in size, they become fully grown, and are then from 1 inch to 1½ inches in length, greyish to greyish-green in colour, and generally possessing a "greasy" appearance (Fig. 1). When fully grown, these cutworms pupate in the soil, later emerging as the adult moths, and the life cycle is then repeated. There usually are two broods in one season.

Control.

Of primary importance in the control of cutworms is the elimination of weed plants under which the spring eggs are deposited. Careful attention to this factor, will, in a great measure, minimize future losses.

The generally accepted method of controlling cutworms is the use of poison bait. This is prepared from the following formula:—

Bran	.. ..	24 lb.
Paris green	..	1 lb.
Water	.. ..	3 gal.
Salt	.. ..	8 oz.

It was shown first in New South Wales, and it has been our experience in Victoria, that the addition of half-a-dozen crushed lemons to the above formula increases its effectiveness.

The bran and Paris green should be thoroughly mixed together in a dry state, and then the water, in which the salt and crushed lemons have been dissolved, slowed added until a damp (not sloppy) mash is formed. If Paris green is not obtainable, then arsenite of soda can be substituted, using 12 oz. of arsenite of soda for every 1 lb. of Paris green in the original formula. It should be pointed out that this bait, however, is not as effective as the one containing Paris green, and should be used only when Paris green is not obtainable.

The bait should be scattered over the ground in the late afternoon so as to be fresh and attractive to the cutworms when they emerge from the soil to feed in the early evening. It should be distributed along the rows of plants two or three days before filling in gaps, or, if replanting, should be broadcast some two or three days beforehand. As a rough guide, about 100 lb. of prepared bait (containing roughly 45 lb. of dry bran) per acre is necessary for a single treatment.

In cases where an infestation is abnormally severe, however, it may be necessary to considerably increase this quantity of bait per acre, or even to bait the area several times to obtain a satisfactory control. It should be remembered that the bait is poisonous, and should be handled by responsible persons only, and kept away from all animals.

The Vegetable Weevil.

The Vegetable Weevil (*Listroderes costirostris* Gyll.), which is a native of central America, attacks, in addition to tomatoes, most vegetables. Damage is done to these plants by both the adult and larval stages.

Nature of Injury.

Damage to tomatoes is chiefly confined to that of the adult beetles attacking young plants. The beetles cut through the stem of these plants at the ground surface, but, when the plants are more mature, they ascend the stems and eat the leaves or cut the stems just

below the bud. In this way, they cause a type of damage very similar to that of the common cutworm. Both the larvae and the adult beetles are nocturnal feeders, while during the day-time, they are to be found about the bases of host plants or under nearby clods and rubbish.

Life History.

The adult weevils usually emerge in the late spring or early summer, from earthen cocoons in the soil. They are typical weevils having a distinct snout or beak protruding from the front of the body (Fig. 2). They measure about one-third of an inch in length and about half as wide, are greyish-brown in colour, with a well-defined V-shaped mark of lighter colour towards the extremity of the wing covers on the back. These weevils are gregarious in habit, frequently collecting in large numbers around the stems of young tomato plants, and also under boards or rubbish about infested areas.

Each female lays, on the average, some 500 eggs, either directly on the leaves, or on the soil near the base of the plant. These eggs are whitish when first laid, and about 1-25 of an inch in diameter.

Fig. 2.—Adult vegetable weevils. [After *Essig*

Fig. 3.—Larva (right) and pupa (left) of the vegetable weevil. During the day the larva is found in the soil.

On hatching, the larvae or grubs are of the usual weevil form, being slender, strongly curved, legless, and of a creamy-white colour when first hatched. They moult or shed their skins some four times before they become fully mature. They are then roughly one-third to one-half of an inch in length, and immediately leave the host plant, entering the soil to form their earthen cocoons before emerging as adult beetles (Fig. 3). The larval or grub stage usually occurs during the late autumn and winter months, and the plants most commonly attacked are turnips, beetroot, carrots, and parsnips.

Control.

As with cutworms, the keeping down of weeds in the paddock during the late winter and spring, prior to planting the tomatoes, will assist greatly in reducing the population of these insects on the tomatoes later.

With tomatoes in the field, as soon as the first signs of damage are noticed, usually about November, the plants should be dusted with either a 25 per cent. lead arsenate dust or a 20 per cent. calcium arsenate dust, or else sprayed with lead arsenate; 1 lb. of powder in 16 gallons of water. One thorough application of either of these materials should be sufficient, but if subsequent damage is noticed, it may be necessary to repeat the treatment. It is always a wise precaution to dip young tomato plants in the arsenate of lead solution before planting out, as this will keep cutworms in check as well as controlling the vegetable weevil.

Fig. 4.—Damage to tomato plants caused by the tomato stem caterpillar.
[After *Morgan*

Stem Caterpillar.

Up to the present, the Stem Caterpillar (*Phthorimaea plaesiosema* Turner) has not been recorded in Victoria, but, particularly in the northern areas of the State, it should be watched for, as it can cause quite serious losses if allowed to go unchecked. It is present in the tomato areas of New South Wales between Sydney and Newcastle, and, on occasions, has caused quite severe damage.

Nature of Damage.

The stem borer of tomatoes attacks the plants close to ground level, burrowing within the stems from 6 to 8 inches above ground to an inch or so below (Fig. 4). Infested plants wilt and die usually when about 2 feet high, and when the second or third truss of fruit has set.

The young caterpillars may also mine into the tissues of the leaves, particularly if the plants are well established and tougher. From here they make their way into the petioles or leaf stalks, working down into the stem. The stems of the plant become blackened and shrivelled, the leaves wilt, and the plants may die rapidly.

Occasionally they may enter the fruit, and, on occasions, two caterpillars have been found in the one fruit. They apparently enter the fruit at its attachment to the stalk or petiole, and although feeding is not extensive, tunnelling may occur towards the centre of the fruit.

Life History.

The adult moth is a light greyish-brown in colour, measuring slightly more than ⅓ of an inch in length, with the wings folded along the length of the body. The forewings are narrow, with the tips light-brown and having very distinct characteristic dark-brown patches near their centre (Fig. 5). The insect is readily distinguished from the potato moth, which it somewhat resembles, by the brown markings on the wings.

The eggs, which number about 300 per female, are laid singly on the foliage of tomato plants. They measure less than 1-50 of an inch in diameter, are white in colour, and have numerous minute indentations on their surface. The caterpillars when mature measure approximately half an inch in length, and are greyish yellow to pink in colour. They feed as previously described. They live for a period of

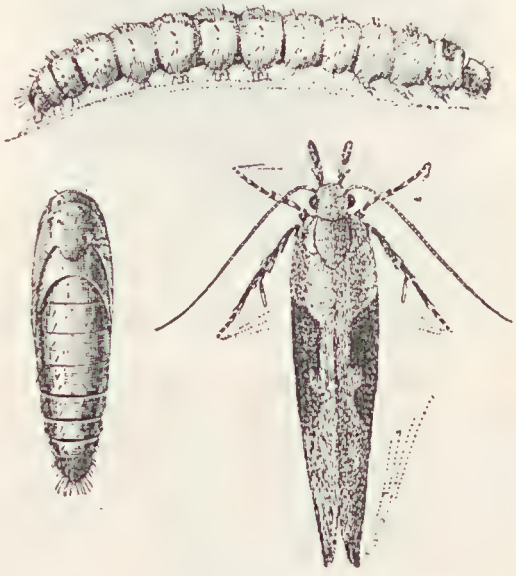

Fig. 5.—The tomato stem borer. Top.—larva or caterpillar; Left.—pupa or chrysalis; Right.—moth in characteristic resting position.
[After. *Morgan*

from three to six weeks before pupating. Pupation usually occurs in the tunnel in the tomato stems in small cocoons, or occasionally in the soil. After about fourteen days in this stage, the perfect insect appears.

Control.

Burn all dead or badly infected plants in the autumn, so as to destroy any larvae and pupae which may be present and which would infest spring plantings. Dust tomato plants, at the first evidence of attack, with a 50 per cent. arsenate of lead dust, or spray with arsenate of lead 1½ lb. of powder to 40 gallons of water to which has been added 3 pints of white oil emulsion. Treatment should commence not later than three weeks after planting, and the treatments repeated at weekly intervals for one month.

Fig. 6.—Showing typical damage caused by larvae of the leaf-eating ladybird.

The Leaf-Eating Ladybird.

The Leaf-Eating Ladybird (*Epilachna 28-punctata* Fab.) is not, at the present time, recorded from the tomato-growing areas of the State. It is present in eastern Gippsland only, and tomato growers should keep a sharp look-out for this very serious pest.

Nature of Injury.

Both the larvae and the adult beetles are active feeders, the larvae being most commonly found, but not always, on the under surface of the leaf. The adults, however, do not appear to have any special preference, being found feeding both on the upper and under surfaces. Irregular patches are eaten out of the leaf, leaving a thin network of tissue on the opposite side. A badly damages leaf has a lace-like appearance, the tissues of the leaf being eaten away in patches (Fig. 6). A few of the insects (either larvae or adults) feeding on the foliage usually only retard the growth of the plant, but, when present in large numbers, defoliation may take place, resulting in death.

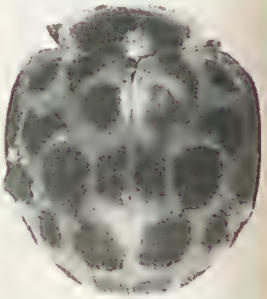

Fig. 7.—The leaf-eating ladybird—adult insect.

Life History.

Over-wintering occurs in the form of the adult beetle, either sheltering at the base of low-growing shrubs, under the bark of eucalypts and acacias, or around those weed host plants as can survive winter conditions. With the commencement of spring, the first eggs are laid on the foliage of host plants.

The eggs are elongate in shape, yellow in colour, and measure about 1-12 to 1-16 of an inch in length. They are laid during the day in clusters of from 6 to 50 eggs, on the under surface of the foliage. In roughly four days these eggs hatch.

The larvae or grubs are pale-yellowish in colour, measuring up to ⅜ of an inch in length when fully grown. The surface of the body is covered with a number of stiff branched spines, greyish in colour with rather dark tips. A period of roughly four to six weeks is required for the larvae to become fully grown. When fully grown, they show a tendency to gather together at the base of the host plant and then pupate. After about seven to ten days in the pupal stage, the adult beetle emerges.

The beetle is oval in shape, with the tip of the abdomen more or less pointed. It measures about ¼ of an inch in diameter, is bright-yellow to orange in colour, with usually 28 dark spots on the wing covers on the back (Fig. 7). There are two complete generations of this insect per year in Victoria.

Control.

Control measures to be reasonably successful must be applied early in the season at the first signs of young larvae on the plant, or as soon as the first damage is apparent on the foliage. The plants should be dusted with a combined dust, containing 25 per cent. of arsenate of lead and 2 per cent. of nicotine. Owing to the rapid growth of the young tomato plant, it would be necessary to repeat the application of the dust so as to enable a thorough coverage to be obtained.

The Green Vegetable Bug.

The Green Vegetable Bug (*Nezara viridula* L.) is a cosmopolitan insect, first recorded as a pest in this State early in 1936. Since that time it has spread over the greater portion of northern Victoria. It is chiefly a pest of tomatoes and beans but may attack other crops, notably potatoes, peas, pumpkins, and melons.

Nature of Injury.

Both the immature and adult insects feed by sucking the sap from the host plants. Although all parts of the plant may be attacked, the most noticeable damage is caused to young shoots, or to the fruit. When young shoots are attacked, they may wilt, wither, and finally die, and growth of that portion is stopped. When tomato fruits are attacked, they become mottled and discoloured, with the formation of a small, brown, corky area at the point of attack.

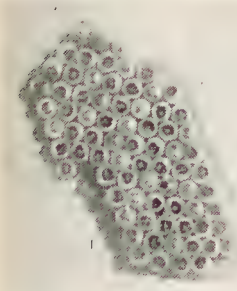

Fig. 8.—Egg cluster of green vegetable bug. Note eggs which have hatched.

Life History.

Although large numbers of this pest may be present in a crop, the adults are not easily seen, as their colour blends so well with that of the crop. When infested plants are disturbed, however, the bugs either drop to the ground or fall on to the lower branches of the plant.

The bugs over-winter in the adult stage, and with the oncoming of winter, change from their normal green colour to dull brown. They hibernate among the leaves of old plants, under the bark of trees, or in cracks and crevices in fencing posts. Early in spring they emerge from these positions and commence egg-laying almost at once.

Fig. 9.—The green vegetable bug—adult insect, a. top view; b. side view.

The eggs which measure roughly 1-16 of an inch in height are laid in clusters of from 30 to 120 eggs, and are placed in regular parallel rows firmly glued together on the leaf (Fig. 8). These egg clusters at first are pale yellowish, but as hatching approaches, become pinkish, and finally, just before hatching, reddish brown.

The young bugs from these eggs measure roughly 1-16 of an inch in length and are bright orange in colour. They usually remain clustered around the egg-mass for a day or two before feeding. While feeding they gradually increase in size and change colour, until, just before becoming mature, they take on the green colour so typical of the normal adult.

The adult bug is a shield-shaped insect, about $\frac{5}{8}$ of an inch in length, and usually of a uniform green colour during the summer

months (Fig. 9). They fly quite readily on a warm to hot day. The complete life cycle occupies some five to eight weeks.

Control.

Clean cultivation is important, as the bugs congregate amongst the leaves of old tomato plants. The destruction of these, particularly late in the season, will kill many bugs which would normally over-winter and commence egg-laying in the spring. The adult bugs are very difficult to kill with insecticides, so that all control measures should be concentrated into the early part of the season, when the young, immature bugs are present.

Pyrethrum dust and pyrethrum dust, mixed immediately before use with an equal quantity of 5 per cent. nicotine dust, and applied liberally to the foliage with a dust-gun, are the most effective materials for the control of this pest. The surface of the soil around the plants should also be thoroughly dusted in order to destroy those bugs which have dropped to the ground.

Rutherglen Bug.

The Rutherglen Bug (*Nysius vinitor* Berg.) usually is a serious pest of tomatoes during hot, dry summers only. When these conditions occur, they appear in enormous numbers, firstly in weeds and grasslands, later moving out on to summer crops such as tomatoes, potatoes, beans, and orchard fruits.

Nature of Damage.

The damage to tomato plants consists firstly of a wilting of the foliage due to large numbers of the bugs sucking sap from the plant. In extreme cases, the plant is so severely attacked that it dies. Secondly, if fruit is present on the plant, a large number of small, corky areas is produced over the surface, which, as the fruit ripens, fails to develop, with the resultant formation of a mottled, crinkled surface.

Life History.

As previously mentioned, this insect occurs only in plague numbers when conditions are favorable for its development. The adult Rutherglen bugs are brown, narrow-bodied insects, measuring about $\frac{1}{6}$ of an inch long, and possessing two pairs of filmy wings (Fig. 10). They are capable of quite rapid flight, particularly on very hot days. Over-wintering occurs in this form under rubbish, weeds, &c.

The small, whitish, elongate eggs are laid either on the flowers or foliage of plants, particularly weeds. They hatch in roughly six days, into young, immature, and wingless bugs, which commence feeding at once on the plant tissue. After feeding constantly and moulting its skin some five times, the adult stage is reached. The adult females then commence

Fig. 10.—The Rutherglen bug—adult insect.

egg-laying at once, with the resultant production of over-lapping generations. The complete life history may be completed in three to four weeks.

Control.

Once the adult insect occurs in any numbers in the middle of summer, control is usually out of the question, and all that can be hoped for is to drive them out of a crop by means of smudge fires. Early in the season when the bugs are immature and incapable of flight, quite successful control can be obtained by the use of a dust consisting of equal parts of pyrethrum powder and 3 per cent. nicotine dust, or a dust containing 7 per cent. creosote and 3 per cent. nicotine. Owing to the large numbers that may be present, and the rapidity with which these bugs breed, it will be necessary to repeat these treatments several times in the season.

In view of the fact that early in the season, feeding and breeding occur on weeds, the necessity for clean cultivation and the keeping down of weeds is apparent.

Thrips.

Thrips (*Thrips imaginis* Bagn.) are only rarely of economic importance to tomato growers in this State, occurring during dry seasons with excessive temperatures. Such conditions occur only at infrequent intervals.

Nature of Injury.

The thrips cause the greater part of their damage to the flowers of the tomato plant; in cases of severe infestation inhibiting the setting of the fruit. Even the fruit that does

Fig. 11.—Tomato leaflets showing damage by thrips.
[After *Samuel*

form is frequently malformed. In addition to this, the young larval thrips frequently congregate in large numbers on the under surfaces of the foliage, and by their sucking activities, considerably weaken the plant (Fig. 11).

Life History.

The adult thrips is light brown in colour and measures roughly 1-25 of an inch in length. Its normal habit is to feed on the blossoms of weeds, fruit trees and ornamental plants. The eggs are laid in all parts of the flowers, particularly in the stamens, and occasionally in the leaves adjacent to the blossoms. On hatching, the immature forms feed either on the under side of the young leaves or, more frequently, cluster inside the blossom and destroy the stamens. On becoming fully fed, these immature forms enter the soil, emerging later as adult thrips.

Owing to the rapidity with which they are able to complete their life history, several generations can occur during the season.

Control.

Where tomatoes are concerned, control measures are not very often necessary, owing to the infrequency of attack. Should thrips appear in abnormal numbers in the blossoms of tomato plants, dusting with a 5 per cent. nicotine dust or a pyrethrum dust should be carried out. It will be necessary to repeat this treatment every two days while the infestation is severe.

Tomato Moth.

The Tomato Moth (*Heliothis obsoleta* Fabr.) is the most serious pest of tomato fruit in this State, losses of up to 50 per cent. of the crop resulting, if adequate control measures are not adopted. It has a wide host-range, such crops as maize, lucerne, tobacco, garden plants, and vegetables frequently being attacked.

Nature of Injury.

The most common type of injury is that done to the fruit. The larvae or grubs usually enter at the stem end, and outwardly very little damage may be apparent. With the development of the larvae inside the fruit, the fruit may either fall, or show the development of "rot" around the point of entry. On cutting open an affected tomato, the interior will be seen to be eaten, a black mass of excreta usually remaining (Fig. 12). Very frequently, the one grub may travel from one tomato to another, until all of the fruit in a bunch is injured.

Two other different kinds of injury may also be apparent. If the grubs of this insect attack the plant at flowering time, they may so completely destroy the buds and flowers

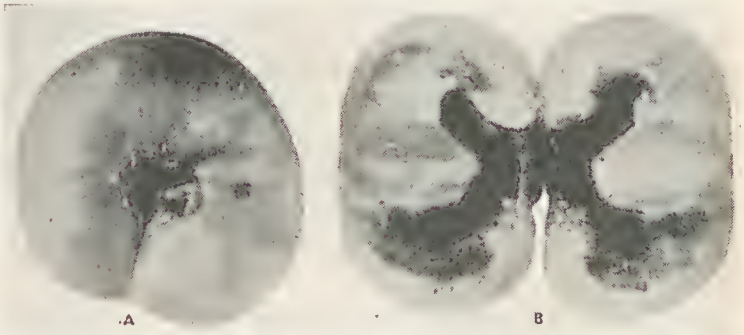

Fig. 12.—Tomato moth damage to tomatoes. A.—Advanced injury of the calyx or stem end with caterpillar in burrow B.—Tomato cut in half to show the internal destruction caused by the caterpillar.
[After *Essig & Michelbacher*

Fig. 13.—Tomato moth showing stages in its life history.

that no fruit is set. In addition, they have been known to attack the foliage, causing a similar type of damage to that caused by the common cutworm.

Life History.

Over-wintering occurs in the soil at a depth of roughly two to three inches in the form of a pupa. With the advent of spring, the adult moths emerge from the soil from October to December. The adults measure roughly 1½ inches across the outspread wings, are generally light brown in colour, with dark markings on the fore-wings, and brown margins on the hind-wings (Fig. 13).

The eggs, which usually are deposited singly on the host plant, particularly on the foliage, are round, slightly flattened, and pale yellow in colour. Some 500 to 800 eggs are laid by each female. These hatch in three to four days during the summer months.

The larvae or grubs hatching from these eggs immediately commence feeding on the tomato fruit, entering usually at the calyx end. After a feeding period of two to three weeks they become fully-grown, matured larvae. They then measure roughly 1½ inches in length and are very variable in colour, ranging from pale green to dark brown, with many stripes. On becoming fully fed, they enter the soil, and pupate several inches below soil level. In from two to three weeks, depending on weather conditions, the perfect moth emerges from these pupae. There are several generations per year.

Control.

Control of this pest can be accomplished either by spraying or dusting with arsenical compounds. On account of their ease of application, dusts are usually preferred to sprays. Where dusts are applied, a 50 per cent. arsenate of lead dust, or where sprays are used, lead arsenate 2oz., calcium caseinate spreader 1 oz. to four gallons of water will prove most suitable.

Applications of either of these materials should be made at intervals of seven to ten days from shortly before flowering time. These applications can be continued right up to picking time in which case the fruit must be wiped or washed before using or marketing; or else discontinued some three weeks before picking, when nicotine dusts can be substituted.

Metallic Tomato Fly.

In some seasons, and particularly one in which tomato moth and green vegetable bug damage is prevalent, the Metallic Tomato Fly (*Lonchaea aurea* Macq.) may be found commonly in the tomato fruit.

Fig. 14.—Metallic tomato fly showing various stages in its life history.

Nature of Injury.

It is not a primary pest of tomatoes, only attacking fruit which has cracked or been injured in some way by other insects. The small, whitish maggots feed on the flesh of these damaged tomatoes, and may completely break down the internal tissues (Fig. 14).

Life History.

The adult flies are small, measuring only $\frac{1}{6}$ to $\frac{1}{8}$ of an inch in length, with bright, metallic, blue abdomens. Small whitish eggs are laid by the female flies in cracks or injuries on the tomato fruit. The flies cannot lay eggs under the skin of fruit with unbroken skins. Eggs hatch in some three to four days during the summer months, the maggots feeding on the flesh of the fruit until they are fully grown. They then leave the fruit, usually when it has fallen from the plants, enter the soil and pupate there. Later the adult flies emerge and commence their life cycle as before.

Control.

The only method of preventing injury of such a nature as described above is to minimize the attacks on the tomato fruits from other insects.

Tomato Mite.

The Tomato Mite (*Phyllocoptes lycopersici* Tryon.) while primarily a glasshouse pest, occasionally occurs in the open, particularly in the northern portion of this State. The condition frequently spoken of as "golden stem" is caused by this mite.

Nature of Injury.

The mites collect on the surface of the tomato plant in large numbers, and give the appearance of golden-brown dust on the plant. Infestation may occur at any stage of growth of the plant, but the presence of the mites usually is not apparent until the plants are well established. The powdery masses of mites first appear on the lower part of the main stems and on the adjacent leaf-stalks. Later, the colonies migrate in an upward direction on to the leaves, stems of fruit and branches and finally on to the fruit. As the mites spread and grow in numbers, the stem develops a smooth, bronze-coloured appearance.

The plants may become stunted and pallid, while the more severely attacked leaves wither and die. Plants which are young at the time of infection usually become severely damaged and eventually die; on older plants, spread of the mites may not be so extensive, but loss of crop usually occurs from reduced yield and damage to the fruit. Where the fruit is attacked, a rough, brown russet develops in the skin, accompanied by small cracks running around the circumference of the fruit, resulting in a characteristic "ringed" appearance.

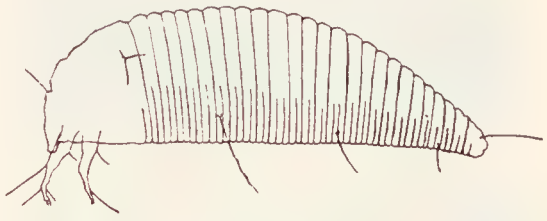

Fig. 15.—The brown surface mite (highly magnified). [After *Samuel*

Life History.

Carry-over from one crop to another in glasshouses usually occurs where two crops are grown in rapid succession each year, such as frequently happens when summer and autumn crops are grown after spring crops. The exact life history of this pest is not known, but it is known that the complete life cycle is passed through rapidly, as a small initial infestation may become acute within a few weeks.

The adult mites are very small, measuring roughly 1-200 of an inch in length, and are creamish in colour (Fig. 15). They produce large numbers of eggs, which are circular in shape and measure about a quarter of the length of the adults. They are smooth, white in colour, and are deposited abundantly on the surface of infested areas. Spread of the mite from one plant to another takes place purely by mechanical means, on the hands and clothing of the workers during pruning, cultivation, picking, &c.

Control.

Treatment to prevent tomato mite infestation must not be delayed until symptoms of damage appear, as by that time the plants will have suffered a severe setback, and some loss of crop will result.

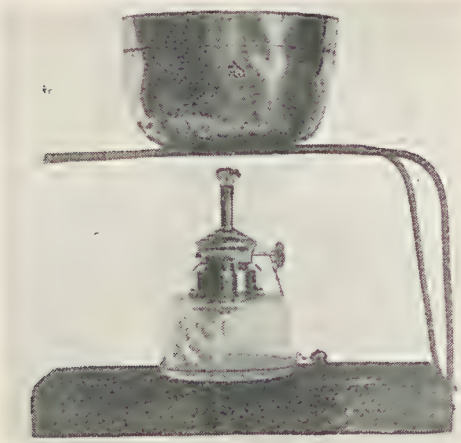

Fig. 16.—Suitable type of apparatus for nicotine sulphate fumigation in a glasshouse. [After *Cottier & Taylor*

Control can be obtained by one of the following methods—

(*a*) *Fumigation of the Glasshouse.*—If the glasshouse is reasonably air-tight, fumigation with either nicotine vapour or hydrocyanic acid gas will give a satisfactory control. It has been shown in New Zealand that if nicotine fumigation is to be used, 1 fluid oz. of nicotine sulphate should be used for every 1,200 cubic feet of space in the glasshouse. To ensure that a lethal dosage of nicotine vapour is obtained throughout the house, it is advisable to have a nicotine-vapour generator (Fig. 16) to each 2,000 cubic feet of space in the house, and to ensure that the nicotine is completely volatilized within one hour. A calm day preferably should be chosen for this fumigation, which should commence in the late afternoon and run throughout the night. In the morning the house should be thoroughly ventilated.

If hydrocyanic acid gas fumigation is resorted to, then a dosage of from ¼ to 1-10 oz. of sodium cyanide, or its equivalent in calcium cyanide, per 1,000 cubic feet of space, depending on the structure of the glasshouse and the condition of growth of the plants, is usual. This fumigation also should be carried out at night.

(*b*) *Spraying.*—This mite can be controlled by spraying with nicotine sulphate 1 in 800 plus 1½ lb. of soap to 50 gallons of water. The first application should be given as soon as the flowers commence to appear, and repeated at intervals of from two to three weeks.

(*c*) *Dusting.*—Dusting with nicotine dusts, 2½ per cent., or with fine sulphur mixed with an equal amount of hydrated lime will also control the mite.

White Fly.

The White Fly (*Trialeurodes vaporariorum* Westw.), an introduced pest, thrives under greenhouse and glasshouse conditions in this State, and has caused, in the past, severe losses to tomato growers. There has been a direct loss due to decreased production and a loss due to the fact that tomatoes produced where white fly was prevalent required considerable washing because of a sticky residue left on the fruit.

Nature of Injury.

This insect causes a direct injury to the plant by the sucking of sap from the foliage, which results, in severe cases, in wilting of the plant. A far more objectionable type of

Fig. 17.—White fly—adult insect and eggs on leaf. [C.S.I.R.

injury results from a secretion of honey dew by the insect itself on the surface of the leaves and fruit rendering them sticky. On this sticky sweet medium, sooty moulds grow, forming a black covering over the foliage and fruit and reducing to a great extent the activity of the plant by blocking the stomata. In addition, fruit so damaged is very difficult to clean.

Life History.

The adult white fly is a small, four-winged insect, whitish in colour, and measuring roughly 1-20 of an inch in length. It congregates chiefly on the under-surface of the leaves of the plant (Fig. 17) and makes short, jerky flights to other parts of the plant or to other plants, when disturbed.

Eggs are laid by the adult white fly on the under-surface of the leaves and scattered over the leaves. They are greenish-yellow in colour when first laid but darken rapidly. They hatch usually in some two to three weeks to the immature white fly insect which feeds on the under-surface of the foliage in a fixed position until reaching maturity in roughly three to four weeks (Fig. 18). This life cycle is then repeated.

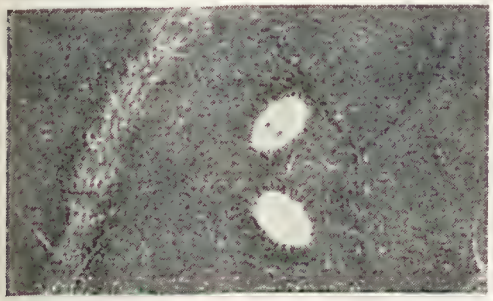

Fig. 18.—White fly immature stages on leaf. [C.S.I.R.

In the northern part of this State, white fly occurs occasionally on tomatoes in the field, but it is more of a problem in the glasshouse.

Control.

There are several methods available for the control of white fly in the glasshouse.

(*a*) *Fumigation.*—Glasshouses can be fumigated with either hydrocyanic acid gas or nicotine, as for tomato mite.

(*b*) *Dusting.*—Dust the affected plants with a 2½ per cent. nicotine dust during the warmer part of the day. The most successful results are obtained by applying this material when the temperature is 75° F. or over. It will probably be necessary to repeat several times throughout the spring and summer with intervals of a fortnight between treatments.

Fig. 19.—White fly parasitised by Encarsia formosa. [C.S.I.R.

(*c*) *Spraying.*—Spray the affected plants thoroughly with a mixture of nicotine sulphate 10 fluid-oz., white oil 3 pints, to 50 gallons of spray, repeating the applications as often as white flies appear.

(*d*) *Biological Control.*—Several years ago, a parasitic wasp, *Encarsia formosa* Wwd., was introduced into this State for the control of white fly. The control obtained was very satisfactory, and, at the present time, white fly does not present the same problem to tomato growers as it did some years ago (Fig. 19).

Aphids.

Occasionally during periods of cool weather, green aphids (sometimes spoken of as green fly) become rather numerous on tomato plants grown in the glasshouse.

Nature of Injury.

The aphids feed usually on the under-surface of the leaves, sucking sap and reducing the vitality of the plant. Quite frequently they are found at the tips of the stems and branches and if very numerous in these positions may cause stunting of the plants. In

addition, "honeydew" is secreted by the aphids as with the white flies, resulting in the production of sooty moulds, which prevent normal plant functions.

Control.

If the aphids become at all numerous in the glasshouse, they can be treated with either a nicotine dust or a nicotine spray in a manner similar to that for white flies.

Thrips.

Under the same seasonal conditions as produce thrips outbreaks in the field, so thrips damage may result in the glasshouse.

Nature of Injury.

The thrips attack the flowers of the plants, and by their constant feeding completely destroy the blossoms or greatly reduce the yield.

Control.

Control of thrips in the glasshouse can be obtained by either dusting with 2½ per cent. nicotine dust or fumigating with nicotine as described under tomato mite.

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On page 387 of the August 1939 issue of this Journal the paragraph in the first column "As this disease . . . . . has given satisfactory control" refers to Root Knot disease of tomatoes and therefore should be transposed to follow "fresh young roots" in the second column of the previous page.

Women's Auxiliary Training League

Scheme Launched

THE Power Farming Association of Victoria has launched a Women's Auxiliary Training League scheme. Women are invited to enrol for a comprehensive course of instruction in the operation of tractors and farm machinery.

The course will comprise 30 hours actual tractor operation, divided into periods of three hours practical training, interspersed with lectures covering tractor maintenance, running, repairs, and lubrication. Sites will be provided adjacent to the metropolitan area, with all amenities.

Trainees completing the course and passing the tests to the satisfaction of the examination board, which will include some of Victoria's leading tractor farmers, will receive a certificate of competence. Honours pupils will be awarded a diploma, and offered facilities to study charcoal producer gas and Diesel-engined tractors. The Power Farming Association will maintain a register, and names of graduates will be forwarded to the appropriate Federal and State Government Departments. W.A.T.L. trainees, if necessary, will be able to replace men who are required for urgent defence work.

The course is free; a medical certificate of fitness is required, but the Association has arranged for free medical examination in Melbourne of the initial applicants. Special facilities will be provided for the training of country women who can spend only a limited time in Melbourne.

Applications for full particulars should be addressed to—

The Secretary, Power Farming Association, McEwan House, 343 Little Collins-street, Melbourne, C.1.

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—April, 1940.

Primary Production and the War

An address by Mr. H. A. Mullett, B.Agr.Sc., Director of Agriculture at the 38th Annual Convention of the Chamber of Agriculture, at Wangaratta, March, 1940.

ANNOUNCING this address, a section of the press did me the honour of stating that I would attempt to forecast the changes in agricultural production that would take place during the war. Let me at once disclaim any such intention, as I am very conscious that the mantle of the prophet has not yet descended upon me.

I am satisfied that to remove the subject from the realms of speculation and prophecy, so far as our overseas trade is concerned, we need an authoritative statement from the British Government as to what her future requirements will be, and, so far as our home market is concerned, we await decisions of the Commonwealth regarding crops like flax and tobacco. The task is no light one for either of the two Governments concerned, for the answer to the problem depends on the course of the war, and who can predict that?

"In war time it is our duty, as well as good business, to deliver the total quantity of produce that Britain is willing to buy."

Britain's present requirements of agricultural produce from Australia were officially expressed in the contracts she made with the Commonwealth Government for the various forms of primary produce she has purchased; but so far as I know, except in the case of wool, there is as yet no firm indication as to what her future requirements will be. When that is forthcoming it will be possible to plan our agricultural effort in respect to export crops during the war. In the absence of any

information from authoritative sources as to what our future exports are likely to be, we are left to our own devices.

The best guides to the requirements of Great Britain in the very near future, I take it, are the current contracts which have been concluded between the two Governments in respect of the principal primary products, wool, meat, butter, cheese, eggs, &c. Extracts from these contracts were furnished the Commonwealth Parliament on 15th November last. Of these contracts, wool is the only commodity in which the whole of the amount we can produce has been purchased for a longer period than one year. The contract covers a period for the duration of the war "and one year afterwards." All other contracts are limited to a short period, and contain clauses limiting the quantity of produce which the British Government agrees to take.

In the case of meat the period was from 1st October, 1939, to 30th September, 1940, and the quantity was fixed at 240,000 tons. With butter the period was 13th November, 1939, to 30th June, 1940, and the quantity was 75,500 tons, which is on the basis of 94,500 tons per annum. The contract for cheese was effective from the outbreak of war to 30th June, 1940, and the quantity which the British Government contracted to purchase was 13,000 tons, which is on the basis of 16,500 tons per annum. In the case of meat and eggs the British Government indicated that it would endeavour to lift any additional quantities produced, but, apparently, no such indication was given in the case of butter and cheese.

As to whether the quantities named in the current contracts are likely to be short delivered in some cases or exceeded in others, and what takes place if the quantities fixed in any contracts are exceeded, it is not in my province to discuss, and I leave that part of the subject to expert opinion, and also such questions as the limits, if any, that are likely to be set in the future on the export of our primary produce, and whether there is any recent information that the course of the war is affecting Britain's capacity to find the necessary refrigerated tonnage to lift our surplus.

My object in raising this aspect of our overseas trade is to put forward the opinion that if there are any limits set in future contracts, and if the limits set for the respective products are anything like the quantities named in the first contract—and they were not unreasonable quantities—sooner or later we will fall down on the job of fulfilling the contracts, or some of them. There is, of course, no penalty clause for failure to supply the full quantity which Britain undertakes to purchase, but in war time it is our duty, as well as good business, to deliver the total quantity of produce that Britain is willing to buy.

A study of the statistics for the export of meat over the past five years will illustrate the point. The meat exports to the United Kingdom for the period 1934-35 to 1938-39 have fluctuated between 164,000 tons and 224,000 tons. These fluctuations are largely due to the influence of varying seasons on the growth of grass; that is to say, to our practice of placing almost entire dependence upon grazing to furnish *all* the food that stock require. That means that the volume of our exports is as variable as the weather!

I suggest that we should set about a policy of endeavouring systematically to level up our production of live stock during the war. We should look upon this as a worthwhile war effort which producers could make as a duty. To do this we need to conserve *much* more fodder such as grass, cereal hay, and grain such as oats, and to sow more forage crops for grazing such as oats, as well as maize, millet, &c., in suitable districts. Last season, in a year of bounteous pasture growth, the quantity of grass that was baled as hay, stacked, and ensiled was particularly gratifying; but no one will deny that the amount that went to waste would have been sufficient to level up our production for some years to come.

Hitherto the principal effort for fodder conservation has been to offset a major drought. This is a most important objective and our paramount fodder problem, but we should face up to a more systematic supplementation of the natural pastures during dry spells, in order to level up production. To do that without touching the drought reserves means substantially increasing the quantity of fodder normally stored, and substantially increasing the area of fodder crops normally sown.

I feel that if the steep fluctuations in Australia's exportable surplus of primary products could be to some extent ironed out, and if we could show ourselves as capable of a reasonably steady output, it would help those who will have to undertake the responsibility of negotiating war and post-war agreements with the British Government, and it will help the British consumer, who may need that help. As you know, for a few years prior to the war we had practically reached saturation point on the British market, and were deeply concerned that restrictive quotas may begin

An increase in the Victorian acreage sown to flax from 2,000 to 8,000 acres is considered necessary to replace the imports of soft fibres used in the manufacture of twine, corn-sacks, &c. A crop of the Liral Crown strain is illustrated above.

to exert a real effect upon Australia's ability to market the whole of the produce she produced. But for the war, it looks as if we may have had to face restriction in some products this year because of the bounteous season. The imperative necessity for Britain to augment her food supplies has helped us, and no doubt will continue to do so, so long as there is sufficient shipping available to lift our produce.

The stabilization of the export market for pork and bacon has resulted in a marked fillip to the pig industry, but, as yet, the quantity exported relative to the total meat export is very small indeed. My Department has not been made officially aware of the prospects, if any, that there are for an expansion in this market. If such information were available, the Department is in a position to stimulate the production of pigs, especially in the wheat belt, where they may form a useful side-line for producers and be of some assistance in reducing the quantity of surplus wheat. *Until some authoritative pronouncement is forthcoming from those responsible for marketing our produce abroad, it is impossible to give growers any lead as to what they should do relative to production of the staple market crops.* All that one can say at the moment is that any considerable capital investments for the purpose of increasing production would not be warranted in view of the uncertainty of the future, and that any increases in production should be attained by the use of the kind of scientific methods that reduce the cost of production per pound of produce raised, and hence assist in placing us in a position to meet the inevitable competition which we must face after the war.

When we consider the changes that are necessary in agricultural production to supply the Australian market during the war, we are on sounder grounds. The Commonwealth is believed to be desirous of stimulating the production of flax, and, in order to save dollar exchange, is said to be deliberating upon the advisability of increasing the acreage sown to tobacco in this country.

So far as flax is concerned, an expansion from 2,000 acres sown in this State last year to between 7,000 and 8,000 acres is necessary in order to replace imports of soft fibres used in the manufacture of sowing twine for corn-sacks, flax yarn, flexible ropes and cordage, &c., which fibres are difficult to obtain owing to the war. It is understood that the Commonwealth may impose some sort of control that will virtually restrict plantings to flax of the

"The growing of tobacco is a highly specialized industry."

new Liral Crown strain and similar improved, tall-growing, fine-fibre flax types, and limit companies engaged in the manufacture of flax to those competent to undertake the water-retting process. If this is done, the industry will produce high-grade flax, and the farmer will be protected from both the bogus and the well-meaning but incompetent company promoters, some of whom have cost the farmer dearly in the past.

The Department of Agriculture has conducted an intensive series of field experiments during the past few years, and is in a position to furnish expert advice on flax growing to intending growers. Information on the technique of growing, harvesting, and manufacturing flax and the districts and soil upon which it can be successfully grown is available, but farm-to-farm instruction must remain in abeyance until the growers themselves, after consideration of the Commonwealth scheme and the price to be paid, decide who is to grow flax. The matter is rather urgent, as land to be sown to flax should be prepared immediately, as it is essential to have it in good tilth and weed growth eliminated before the seed is sown in June.

It will also be necessary to select five or six additional mill sites, each capable of treating the produce of 1,000 to 1,200 acres of flax, and to conclude contracts between manufacturer and producers for the growing of the flax. This takes time.

The price for processed flax fibre overseas has risen from approximately £100 to over £400 per ton, but it is understood that it is not intended to correspondingly increase the normal price paid for flax straw here; that is to say, £5 a ton. Nor (so it is said) will the manufacturers be able to sell the processed fibre for inflated prices. When the price for flax straw is announced, producers will no doubt decide for themselves whether the price offered them bears favorable comparison with alternative crops. The average yield per acre is approximately 1½ tons, and dockage is made for weeds and short length of straw.

If the Commonwealth Government desires to replace a substantial proportion of the tobacco imported from Virginia, there is no doubt that Australian growers will rise to the occasion. Anything resembling the boom which was created in 1931 by steeply raising the duty on imported tobacco is to be deprecated

[*Continued on page 164.*

Land graded and checkbanked on the border system.

Grading Land for Irrigation

By L. C. Bartels, B.Agr.Sc., Senior Agrostologist

IRRIGATION by flooding is the method commonly adopted in Victoria to water crops and pastures, and underlying good irrigation practice is the need for proper layout of distributary channels and grading and checkbanking the land to permit efficient distribution of water. To secure uniform growth, water must be applied uniformly, and so the direction and volume of the flow must be regulated. It is important too, to avoid waste by percolation or by unnecessary overflow.

There has been an evolution in irrigation practices in this State. What is called the border system of irrigation is in almost general use, and happily the crude methods of wild flooding, which characterized earlier practices and still survive in places, are giving place to irrigation by the border method, which can be modified to suit most conditions.

The first requirement—a surface survey.

Layout for the border system of irrigation involves the division of the land into bays or compartments by small levee banks which run down the slope—the land between the banks is levelled from side to side, and as far as possible the land along the length of the bay is reduced to a plane surface with a uniform slope. To facilitate the passage of implements it is desirable to have the banks parallel, but it should be borne in mind that straight banks and parallel banks are not an essential feature of the system.

The dimensions of the bays may be varied to meet altered conditions, but they are governed by such considerations as the slope

The buckscraper does good preliminary work in filling the bigger depressions and in transporting large quantities of earth long distances.

and porosity of the soil, and the amount of sidefall of the land. The position and course of lateral water channels are necessarily important factors.

To conform to good standards, the bays may vary in length from 2 chains to 15 chains, and be from $\frac{1}{3}$ chain to 1 chain in width. In porous soils short bays are desirable, otherwise there is risk of excessive absorption in the upper part of the bay while water is travelling over it to the ends. Likewise, when the land has flat grades, the bays should be shortened to avoid too much water lodging on the soil surface after irrigation. When sidefall is great, the banks should be erected closer together, because this will permit the transverse levelling of the bay to be done with the shifting of less earth, and the borders or check banks may be kept reasonably small.

On the clay loam soils of the Goulburn Valley and Werribee districts, suitable dimensions for irrigation bays, fitting most conditions, are 10 chains long and $\frac{1}{2}$ chain wide. When settled, suitable banks may be about 4 feet wide and 6 or 7 inches high. When newly constructed they may be 9 or 12 inches high.

Land grading preliminary to banking.

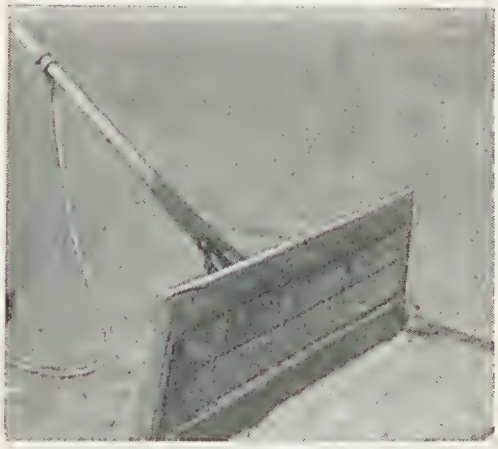
Marking the site of the checkbanks.

Under the border method of irrigation, water is admitted from a lateral channel at the head of the bay. It spreads across and travels in a sheet down the bay. When the water reaches a certain point towards the end, depending on the soil and the volume and rate of flow of the water, it is cut off at the inlet to the bay. If the judgment of the irrigator is good, the spread is completed along the whole length with a minimum of waste. Because that judgment may be faulty or heavy rain may fall just after an irrigation, provision for drainage is necessary. Excess water then may be taken away to drainage channels or led to lateral distributary channels to be used lower down the field.

It should be noted that cross checkbanks are not recommended. Although it was common in the early stages of irrigation to erect cross banks to ensure the lateral spread of water, so dividing the land to be irrigated into rectangular compartments, such cross banks are objectionable. Besides necessitating the gathering of extra surface soil in their construction, they generally lead to ponding of the water, and crops such as lucerne are very sensitive to excess wetness. It is a fact that in some districts in Victoria this cross check system of grading aggravated the troubles arising from too great an absorption of water. Under the border system, the spread of water is achieved by levelling the bays across, and when crops are growing they too help to spread the water.

Much of the land under irrigation in Victoria was originally timbered, and generally the most uniform land has minor irregularities arising from the removal of trees or through crab hole formation. Ordinarily however, the repeated cultural operations involved in cereal growing have smoothed out most of the unevenness. Where newly cleared land is to be brought under irrigation, extended preparation is desirable.

The farmer may know the prevailing direction of slope, but he cannot rely on his judgment, and it is advisable to have the land surveyed and a contour plan prepared. In Victoria, the engineers of the State Rivers and Water Supply Commission are very helpful in this matter, and will make a chess board survey and prepare a contour plan for a very low charge. They will guide the farmer as to the best layout for channels, banks and drains.



A simple implement—the buckboard.

Showing successive operations of a buckboard in forming a bank.

If the farmer can plan far enough ahead, he may, with advantage, do a preliminary grading in one year, sow a preparatory crop and later complete the work. Although an apparently good job is done in erasing the knolls and filling the depressions, by the first operation these irregularities may reappear when the earth consolidates. In preparation for grading, the soil on the land to be graded should be brought to a good tilth so that it will move freely under the grading implements.

A word should be said about the construction of the channels. As time goes on, the maintenance of channels in clean condition may entail a lot of laborious work because of the growth of weeds and such plants as paspalum, which obstruct the flow of the water. These grow because the channel does not drain out properly —this will follow if the channel is cut into the ground. It is recommended that, if practicable, the level of the channel should be raised. This involves the gathering of some earth along the line of the channel as a preliminary operation. This is quite desirable except in those cases where the soils are loose or self mulching and "melt" rather easily.

Various implements are available to the farmer for land grading and making check-banks. They range from the simple buckboard to the elaborate road grader, but there are several makes of land graders which do excellent work and are available at moderate cost.

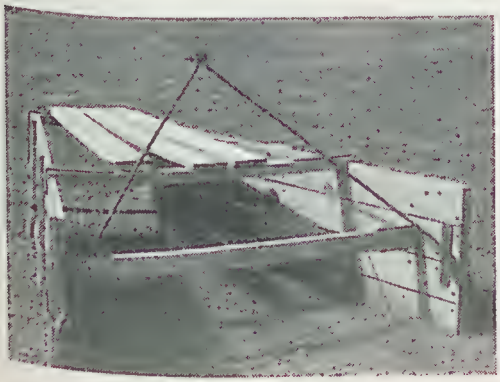
The buckboard or grading board is a very simple device and may be constructed cheaply by any blacksmith or handy man. It is made from 2-in. hardwood and usually is about 8 feet long and 18 to 20 inches wide—thus two 9-in. boards or three 6-in. boards may be used. They are cleated together, preferably by bands of iron. Two of the cleats will be about a foot from each end. On one edge of one face of this board a strip of $\frac{1}{4}$-in. iron about 3 inches wide is bolted on—this may now be considered as the bottom front edge of the board.

On the back of the board, near the top, a wooden handle, made of 3 in. x 3 in. hardwood or 2-in. pipe, is affixed at an angle, and secured in position by three iron stays. A short rope is affixed to the end of the handle. Through the two cleats mentioned previously, holes are bored at about 6 inches, 7 inches, and 8 inches from the bottom edge, and eye bolts are put

Earth is gathered transversely and dumped at the furrow marking the site of the checkbank.

through one of these on each side. The pull of the implement is made on these eye bolts, and the three holes permit the operator to move the eye bolts to secure a balance between the pull of the horses and the pressure which may be put on the handle. The bottom edge of the board acts as a fulcrum.

When the horses are pulling the board and it rides on its face, the handle is pointed forwards but the attached rope trails behind. When the rope is pulled, the board is brought into an upright position, and as soon as the top edge comes behind a vertical position the bottom presents a cutting edge to the surface,



A home-made crowder.

and the traction causes it to gather earth which is pushed in front of the board. If the pressure on the handle is eased, the board will assume an upright position and the earth may by transported over considerable distances. When the pull on the handle or rope is further eased and the top edge of the board goes further forward, the earth in front of the board begins to slip beneath. A sudden loosening of the pull causes the earth to be dumped. Some boards are fitted with iron bows in front near the end, and these permit easy handling. An experienced operator will do excellent work with a buckboard.

If it is decided to make the bays ½ chain wide, the site of the banks may be marked by a plough furrow, and then material for them will be gathered from the surface between. The objective is to make the bays as nearly level across as possible, so the earth should be gathered mainly from the higher side. The accompanying illustrations show successive stages in the construction of checkbanks.

To shape the banks, a simple implement constructed of 2-in. hardwood and made up into two sides like so \/ may be used. The length of this V crowder, as it is called, may be 6 to 10 feet long, the height 9 to 12 inches. Standing on edge the boards are fixed at 4 or 5 feet

A crowder shaping a checkbank.

apart in front and about 2 feet apart at the back. The implement is drawn from hooks at the wide end, and, as it is pulled along the line of the checkbank where the dumps of soil have been dropped, it gathers the soil and brings it together and leaves a neatly-shaped bank behind.

Mention must be made of another implement, the buck scraper, which is simply a big scoop, usually made of iron. This implement has a handle fixed at an angle to the centre of the back and the floor. It rides on two skids which raise the back of the scoop some two or three inches but taper off to the front so that when at rest the front edge of the scoop is inclined into the earth but the back edge of the skid is a "heel," which acts as a fulcrum when pressure is put on the handle. The pull is from both ends of the back.

When pulled along, the scoop gathers earth. With slight pressure on the handle, the front edge lifts and the scoop rides on the skids and the earth may be carried in big quantities over long distances. A sudden lift on the handle

A modern land grader converted to a crowder.

Earth gathered across the bay is dropped on the site of the checkbank.

causes the front edge of the scoop to dig into the earth and the pull causes the scoop to capsize, dropping its contents. A rope on the handle enables the operator to pull it back into position when required. This is a useful implement when much shifting of earth is necessary. It can even be used to do the work of the buckboard.

As stated previously, good work in grading and checkbanking may be done with the implements described above, and because they are relatively cheap, they are used generally. Their efficiency, however, depends largely on the skill of the operator. The more elaborate land graders, which are essentially on a rectangular frame of big dimensions, have, to a certain extent, an automatic action.

The moveable grading board which may be across the frame is manipulated by levers on quadrants adjusted to make the work easy. In some, the grading board is affixed diagonally, and the earth, as it is gathered, is delivered at the side in a neat bank. This accumulates with each successive stroke of the implement until a bank of the required size is laid in the place desired. If the land has sidefall, this operation may be used to correct it, and the soil should be gathered from the higher side of the bay, to make the bay level across. A little thought will show why the transverse operation of a grader is likely to ensure a more effective job.

On these bigger graders, the operator rides above the dust which the grader stirs up, but the main advantage which one must assign to them is that their action is automatic. Because they have length from front to back they bestraddle the bumps and bridge the hollows, and so in their passage over the land they scrape knolls and drop earth in the depressions. A carpenter may smooth a board with a small plane; to make it level he uses a long one.

Of course, a farmer on a small block may find a big grader beyond his means. Its use entails possession of a large team of horses or a tractor. He can compromise in the matter by using a louvre type of grader in conjunction with a buckboard, but where extensive areas are to be graded a modern land grader is to be recommended.

In the construction of lateral channels and drainage ditches, a most useful accessory is a delver. This is another simple implement, the making of which is within the capacity of a handy man. An accompanying illustration

Illustrating the work of a delver.

shows its design and use. Consider two pieces of hardwood timber 9 in. x 3 in.—one 12 feet long, the other 9 feet long. The longer one is extended by plate iron to a sharp edge in front. Near this front the shorter board is affixed by a hinged joint. The boards are open to form a V, and the opening of this V may be varied and fixed by a cross rack made of two overlapping iron places with bolt holes. You have in this the essentials of a delver. It is drawn from a link above the front end, and when pulled in the furrow of ploughed land it pushes the loose earth of the sod to the side. The erection of "delver banks" is a crude method of checkbanking, permissible perhaps in emergencies, but not to be recommended.

In the new irrigation areas of Victoria, farmers should not compromise on the matter of grading their land and checkbanking properly, and farmers in the older irrigation districts, wedded to the bad old ways of early days, may accept the assurance that proper lay-out of land for irrigation will ensure better crops, more efficient use of water, reduce labour and avert the unfortunate consequences of careless irrigation.

Primary Production and the War *(continued from page 156)*

because, in the end, the expansion of the industry at such speed resulted in great disappointment to many tobacco growers and to manufacturers.

The growing of tobacco is a highly specialized industry in which not only is the growth of the crop in the field a skilled operation, but also technical knowledge is required during the sweating and flue-curing processes. By reason of the too attractive prices created in the boom, many persons entered the industry without knowledge and new districts were opened up without adequate trial. The acreage sown in this State increased from 2,650 acres in 1930-31 to 12,190 in 1931-32, and reached the record figure of 13,400 acres the following year. It then fell away rapidly, and this season the acreage sown was 2,300.

If the Commonwealth desires to stimulate production there is little doubt that, in the light of past experience, steps will be taken to prevent an unhealthy boom.

Apart from growing crops to replace products normally imported, we should not lose sight of the fact that once more it has been brought home to us that the Australian market for primary produce is the most suitable and profitable one, and therefore should be sedulously cultivated. One would expect an increased number of migrants after the war: not necessarily assisted migrants but people with some capital, anxious to escape from crushing taxation in the Old World and to put the greatest possible distance between themselves and the possibility of being bombed by aeroplanes. This should increase the local consumption of foods and tend to reduce surpluses, provided such people do not add to the number of primary producers.

With some products we need not wait until the end of the war to attempt to increase local consumption. I will content myself with one example. It should not be difficult to induce the ladies of this country to exhibit a greater preference for wool garments than to artificial substitutes for wool. The wool display arranged at the last Royal Show by the Department of Agriculture, in conjunction with the Australian Wool Board, should have indicated the possibilities of stimulating the consumption of wool by active propaganda methods.

Sowing Flax for Fibre

By A. A. Lee, B.Agr.Sc., Assistant Inspector of Agriculture

Careful preparation for flax brings good returns. A 3½ ton crop of flax in the stook at Strathkellar.

Following the action of the Commonwealth Government in calling tenders for the supply of flax fibre, it is certain that the area in Victoria to be sown with flax in the coming season will be considerably in excess of the 2,000 acres sown in 1939. While the growing of flax presents no serious difficulties to the farmer, extracting the fibre from the flax straw is a specialized business which is undertaken in Victoria by flax mills. Flax is a bulky crop to transport and any extension in area therefore can take place only in those moister districts of the State which are served by existing flax mills, or in other favoured areas should additional mills be built there.

FLAX for fibre is grown in much the same way as oats for hay, being sown in the winter with an ordinary grain drill and maturing at the end of November or in December. The crop is cut before it is dead ripe with a reaper and binder, and then stooked in the paddock for a week or ten days before being despatched to a flax mill.

Before intending growers think of sowing any flax, however, it is essential that they arrange a contract with the manager of a recognized flax milling company. Under such contracts, seed is being supplied at £1 per bushel of 56 lb., and the resultant crop, if of standard quality, is purchased at £5 per ton delivered to the nearest mill.

Summary.

Flax for fibre is grown in much the same way as oats for hay.

Flax should be grown only under contract to a recognized flax milling company.

Flax grows well in the moister areas of the State, e.g., Gippsland and parts of the Western, Central, and North-eastern Districts.

Flax must be grown in rotation to avoid "flax wilt."

Flax needs a fine tilth, shallow mul.h, and even seed bed.

Early ploughing and thorough cultivation, especially in districts where pea mite is prevalent, are essen.ial.

Flax seed is normally sown shallowly at 70 lb. per acre during June, with 1 cwt. of superphosphate.

Climate and Soils.

It is generally considered that flax requires a district with an average annual rainfall of at least 24 or 25 inches, and flax has proved itself on practically all soil types in the moister areas of the State, e.g., Gippsland and parts of the Western, Central, and North-eastern Districts. Unsuitable soils in these districts are rich river flats, which would produce undesirable, rank crops, and very light sandy types. It is quite possible that certain additional areas in the Western District—e.g., Westmere, Lake Bolac, Lismore, &c., with a rainfall between 22 inches and 24 inches—may prove suitable, and exploratory sowings have been arranged in these districts.

Rotation.

Unlike oats, flax should not be grown on the same ground more often than once in five years, as otherwise the land tends to become "flax sick," due to the accumulation of a fungus disease—*Fusarium lini*—which causes flax wilt. Flax, therefore, should be used in rotation with such other crops as oats, barley, rape, millet, peas, potatoes, or the paddock left out in pasture. Overseas, wherever flax is grown, rotation of some sort has been found necessary, and the occurrence of wilt in Victoria, on land cropped too often with flax, has demonstrated the necessity for such precautions here. Flax

usually is sown on lea ground or following potatoes, rape, or millet in the rotation, to be followed in turn with oats, barley, or peas, but there is no definite rule provided the land for flax can be expected to be free from weeds or self-sown cereals.

Flax is not suitable for use as a cover crop in sowing down pasture, but could precede an oat crop used for that purpose. Flax does not cover the ground in its early stages, and will not suppress any strong growing weeds such as wild oats, mustard, wild radish, fumitory, &c. Care, therefore, should be taken in selecting clean ground for flax, as weeds cut with the crop reduce its market value.

Cultivation.

For best germination, flax seed needs an environment suited to its small size, and a rough, cloddy tilth which might be suitable for oats is quite unsuitable for flax. Unlike the cereals, flax is a "dicotyledon" (a plant having two cotyledons or seed leaves); and, on germination, the seed itself is pushed through the ground to enable the two cotyledons contained in the seed to open out as the first "leaves." It is thus more difficult for flax to force its way through the ground than for the fine-pointed shoot of oats and barley. A thin stand of fibre flax will not stool out like oats and barley, and a poor germination results in a reduced yield of coarse-stemmed flax. All cultivations, therefore, should be to this end, i.e., the preparation of an even seed bed with as fine a tilth as practicable, and a shallow mulch at sowing time.

In the Western District and elsewhere, if pea mite is prevalent, it is necessary to plough pasture land for flax as early in the year as possible, so that the mites are starved out before the time to sow flax, normally in June. Ploughing grassland in pea mite districts and sowing within a week or two must be avoided at all costs, as it may quite easily result in crop failure through the ravages of the pea mite as the crop germinates. In Gippsland, it has not been found necessary to plough early for this reason, and excellent crops have been produced by ploughing pasture land with a mouldboard so that the sod is well covered, and then lightly working the top with spring-tooth and harrows.

In all cases, however, sufficient preparation must be given so that a fine tilth and even seed bed with a shallow mulch are ready at sowing time, and it is better to delay sowing to obtain a good kill of weeds than to sow before the weeds have struck properly.

Time of Sowing.

When the slow-growing, late-maturing variety Blue Riga was generally grown in Victoria, sowing as early as April was considered essential; but, now that the pedigreed fibre strain Liral Crown is available, sowing is usually delayed until late May and June and in some cases July, as Liral Crown grows comparatively quickly through the winter and

Ploughing with the mould-board on typical flax country near Drouin, Gippsland.

Showing patchy germination of flax due to deep sowing and dry weather.

matures some weeks earlier than Blue Riga. It must be remembered that flax cannot be eaten off like oats, and sowing too early may result in tall crops which tend to lodge, or it may mean that crops are so forward in the early spring that they become susceptible to damage by frost.

On light land where a rank growth would not be expected, sowing from mid-May to early June would be suitable, mid-June could be regarded as the normal time in most districts, while on rich, well-drained land late June and early July sowing would assist in keeping the crop from growing too tall with the consequent risk of lodging. In certain seasons, late July and early August sowings may be quite successful, as on very rich volcanic soils in late districts, but there would always be the danger of the season drying out before the flax had made sufficient growth. In deciding the best time to sow, growers must be guided largely by their knowledge of their district as a whole, by their intimate knowledge of the paddock where the flax is to be sown, and by the season.

Drilling.

Flax for fibre is normally sown at 70 lb. (1¼ bushels) per acre through the grain box of a drill, the "fine" or "wheat" cups being used. While drill settings for 48 to 60 lb. of dry wheat will give the correct delivery with some drills, the setting will vary considerably, and growers should carefully check their own drills.

The drill may be used to broadcast the seed on the surface by removing the delivery tubes from the hoes, but, unless the seed bed is very loose and there is danger of the seed being sown too deeply, it will be found quite satisfactory to drill the seed in the normal 7-in. rows through the hoes or discs. Great care should be taken, however, to keep the seed as near the surface as possible—¼ to ½ an inch deep is quite sufficient—and, if drilled deeper than 1 inch, there is a definite possibility of the germination being spoilt.

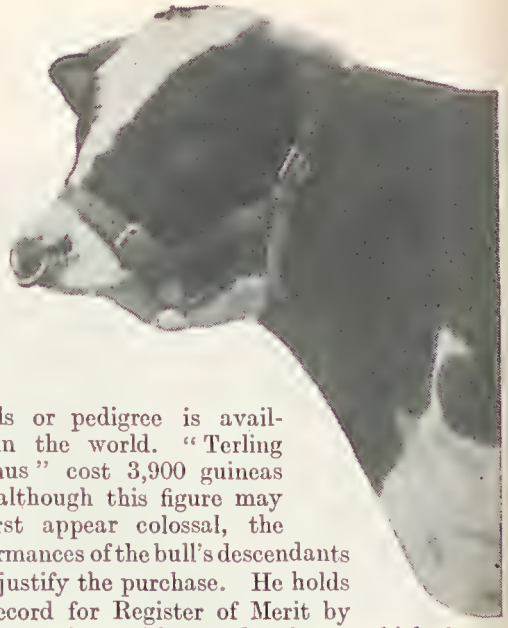
The tension on the individual hoes should be examined to make sure they are all sowing at the same depth, or rather that none is sowing too deeply. A light harrow or chain pulled behind the drill will cover any seed left on the surface, or a light harrowing could be given as soon as possible after drilling. Where conditions permit, a final rolling will level the ground and so allow the binder to cut a maximum length of straw. Drilling round and round rather than in "lands" will facilitate the work of the binder, which cuts better when travelling along the drill rows.

[*Continued on page* 180

The "Victoria" Friesian Stud

New Sire Imported

By A. C. T. Hewitt, M.Agr.Sc., Live-stock Science Officer



IN order to improve the stock in the "Victoria" Friesian Stud, and the supply of bulls to Victorian Friesian breeders and dairy farmers, a very high class Friesian bull, "Terling Hypothesis," was recently imported from England for the Department of Agriculture, and will be located at the State Research Farm, Werribee. Born in June, 1938, "Terling Hypothesis" is a very well-grown youngster. He carries the good type and is backed by the high production for which British Friesians are noted. He was bred by the Lord Rayleigh Farms, The Bury, Hatfield Peverel, Chelmsford, Essex, England, one of the leading Friesian studs in the world, and he is now the third British Friesian to enter Australia, the others having been imported by Mr. A. R. Davis, "Matson," Kyvalley, Victoria, and Mr. Walter Hawker, "Anama," Central Bungaree, South Australia.

The pedigree of "Terling Hypothesis" is shown in the accompanying table, and it will be noted that he is linebred to "Terling Marthus" (imported from Holland), the most famous and outstanding Friesian sire for which records or pedigree is available in the world. "Terling Marthus" cost 3,900 guineas and, although this figure may at first appear colossal, the performances of the bull's descendants fully justify the purchase. He holds the record for Register of Merit by any one sire, with 50 daughters which have averaged 1,354 gallons of 3.6 per cent. milk for one lactation period. No less than 30 of these daughters have produced over 2,000 gallons of milk, the best being "Terling Beechnut 38th" with 3,253 gallons during one lactation and over 2,000 gallons during three others. A granddaughter, "Terling Torch 4th," has produced 3,372 gallons during her best lactation.

The dam of "Terling Hypothesis" produced 17,222 lb. milk, 3.33 per cent. test, and 573 lb. butter-fat during one lactation.

The fact that "Terling Marthus" is the paternal grand-sire and maternal great-grand-sire of "Terling Hypothesis" should inspire all Friesian breeders to seek his blood and the Department to use him judiciously, yet to the fullest possible extent. "Terling Hypothesis" is descended from Dutch stock and is of a type that should "nick" well with Friesian cattle in the "Victoria" stud and in Victoria generally.

"Victoria Conductor," the main herd sire. His dam produced 527 lb. butter-fat.

Purpose of Friesian Cattle.

Friesian cattle are well known for their excellent dairy characters and the good beef value of the steers and culled females. As dairy cattle, Friesians produce very large quantities of milk and butter-fat. The exceedingly heavy milk yields make them very

"Terling Hypothesis"—the recently imported bull.

suitable for whole milk supplies to cities and factories, while the nature and composition of their milk make it ideal for cheese manufacture. Where Friesians are maintained on a butter-fat producing farm, ample skim milk is available for pig feeding.

Friesians are the largest framed cattle, and they fatten fairly quickly into good beef. Although fairly heavily boned, their beef contains a large proportion of very fine textured lean, and the old cows make very useful beef. The bull calves are very large, averaging 92 lb. live-weight at birth, and this fact makes them more valuable than most calves for bobby veal.

Like all good cattle, Friesians must be well looked after to get the best results, and it is realized that, if a farmer does not manage or feed his herd well, he may do better with smaller animals. On farms where the average butter-fat production is high, Friesians are probably the most economical producers.

Prior to 1918, only two important Friesian studs existed in Victoria, but, with the foundation of the "Victoria" and a number of other studs in that year, the breed has made very rapid headway and Friesian cattle have now definitely placed themselves in a leading position amongst Victorian dairy cattle.

Numerically, the Friesian is probably the strongest breed of dairy cattle in the world, predominating in Northern Europe, South Africa and tropical countries, as well as holding strong positions in Australia, England, Canada, New Zealand, United States of America and other places. During the last 35 years the progress of the breed in England has been remarkable, and now nearly 25 per cent. of the English dairy cattle are Friesians and nearly 70 per cent. are Milking Shorthorns. It is also one of the oldest known breeds of dairy cattle, several references to them and their heavy milking characteristics being recorded as far back as the Roman conquest.

History of the "Victoria" Stud.

In 1917, the Victorian Department of Agriculture arranged with the New Zealand Department of Agriculture for an exchange of Red Poll and Friesian cattle, the latter being used to form the "Victoria" Friesian

Stud. All told, eighteen females and two bulls were imported, the most outstanding of which were the cows, "Dominion Madrigal," "D. Kathleen," "D. Coringa," and "D. Woodnymph," all by "Woodcrest Jo" (Imp., U.S.A.), and "D. Hyacinth," "D. Belle Corona," and the bull, "D. Oakdale," by "Oak de Kol 2nd Homestead Fobes" (Imp., U.S.A.). The other imported bull, "Dominion Domino Dutch Boy," was of Longbeach (Mr. J. Grigg, New Zealand) breeding and, although his female offspring did not show to advantage in the "Victoria" stud, his descendants are now amongst the top producers. Three excellent bulls were also imported in utero. Two of these, "Victoria Jo Patch" and "Rock Patch," the latter was to become an outstanding sire in the "Burnbank" stud, were twins from "D. Madrigal" by "Longbeach Big Patch" and the other was "Victoria Milkman Jo" from "D. Milkmaid" by "Woodcrest Jo."

In 1923, the sire, "D. Woodcrest Piebe Mercedes," was also imported from the New Zealand Government. This bull was by "Woodcrest Jo" from "D. Mutual Mercedes of Rock" (Imp., U.S.A.), thus being a full brother to "D. Madrigal," but he left two progeny only in the "Victoria" stud, and one of these was the bull "V. Joyous Mercedes," which proved to be one of the greatest stud dairy sires known in Australia.

After arrival in Victoria, the "Victoria" Friesian stud was divided into three herds, the main section being stationed at Wyuna and the others at the School of Horticulture,

PEDIGREE OF "TERLING HYPOTHESIS."

Bred by Lord Rayleigh Farms, The Bury, Hatfield Peverel, Chelmsford, Essex, England.
Born: 28th June, 1938.

Sire:—

"Terling Prometheus," R.M.P., 44985

"Terling Marthus," R.M.P., 21533 (Imp. Holland). Champion: Essex, 1925 and 1932; Royal, 1925; Three Counties, 1929. Won Progeny Prize, London Dairy Show, 1931 and 1932; Essex and Great York, 1932. He holds the record for Register of Merit daughters of one sire with 50, whose milk yields average 1,354 gallons of 3·6 per cent. milk, and also holds the record for 2,000-gallon daughters with 30, 11 of which gave more than one such yield, including "Terling Beechnut 38th," R.M., R.M.L., which gave one 3,253 gallon, plus three other 2,000 gallon yields. "Terling Beechnut 38th" is also the holder of the British record, having given 149·51 lb. milk in 24 hours. "Terling Marthus's" 2,000-gallon daughters also include one 3-time 2,000-galloner, and nine twice 2,000-galloners; 10 of his daughters are R.M.L. 50-tons-milk production cows, and four have given over 1,000 lb. butter in the lactation.

Thirteen of his sons have sired 22 2,000-gallon cows, including one, the 3,372-gallon cow, "Terling Torch 46th."

"Terling Profit 9th" R.M. First and Champion: Kent, 1932, Royal, 1933, York, 1933. First Inspection and Extra Inspection, London Dairy Show, 1934.

Dam:—

"Terling Eclipse 25th," R.M., 162014.

Production Records.

Year.	Milk. lb.	Test. %	Butter-fat. lb.	Days.
1934–35	9,131	3·4	310	333
1935–36	11,322	3·66	414	286
1936–37	17,222	3·33	573	365
1937–38	12,242	3·42	419	254
1938–39	16,082	Incomplete		280

"Terling Nobleman," P.I.R.M.P. 36613.

"Terling Eclipse 16th," R.M.P., R.M., 121084.

Production Records.

Milk. lb.	Test. %	Butter-fat. lb.	Days.
7,453	4·11	306	282
11,312	3·58	405	313
16,517	3·82	631	349
18,380	3·69	678	364
16,130	3·35	540	308
23,153	3·37	780	365
15,326	3·03	464	365

"Terling Marthus" (See above.)

"Terling Eclipse 10th," R.M., 76754

"Dunninald Haeayemairschaap," P.I.R.M., 7699. Sired four 2,000-gallon cows and also "Terling Warner 12th" which in 1932 broke the world's record for a heifer when she gave 110½ lb. milk in 24 hours.

"Terling Collona 2nd," 87774.

Production Records.

Milk. lb.	Test. %	Butter-fat. lb.	Days.
10,316	4·49	563	248
13,504	3·69	498	341
14,912	3·74	558	321

"Dunninald Haeayemairschaap." (See above.)

"Terling Eclipse 4th" 12428.

"Terling Parade."

"Terling Eclipse."

Burnley, and the Colac High School. When the Wyuna farm was disbanded, the main portion of the stud was transferred to the State Research Farm, Werribee, and by 1930 the whole stud was brought together. The low-production performances of many of the earlier cattle, including daughters of "D. Domino Dutch Boy," were not indicative of their true worth, but at Werribee the herd has had an opportunity to demonstrate its true inherent high milk and butter-fat producing qualities.

Until about fifteen years ago, a definite breeding programme could not be practised, because the stud was divided into three small groups requiring at least one bull for each. For this reason, the majority of the earlier bulls left very few offspring. The two outstanding bulls used at Werribee have been "Victoria Joyous Mercedes" and "V. Topnote," the production performances of which are shown in the tables. With both of these bulls, linebreeding was successfully practised until about 1935, when the need for new blood for outcrossing became apparent.

In 1935, a new herd sire, "Rupertswood Inka Jo," was purchased from the Salesian

A List of the High Production Cows in the "Victoria" Stud.

Name of Cow.	Highest Record in 273 days.		
	Milk.	Test.	Butter-fat.
	lb.	%	lb.
By Victoria Jo Patch—			
Victoria Lean Patch	19,682	3·55	700
Victoria Patchwork	13,875	3·81	528 (Jr. 4)
By Victoria Songboy—			
Victoria Freemartin	20,641	3·20	660
Victoria Songbelle	17,484	3·29	576
By Dominion Oakdale—			
Victoria Chorus Girl	17,624	3·70	652
By Victoria Topnote—			
Victoria Quilt	15,947	3·67	586
Victoria Sonorous Piebe	17,706	3·29	583
Victoria Soprano	15,590	3·38	527
By Victoria Milkman Jo—			
Victoria Joybell	15,387	3·67	565
By Victoria Joyous Mercedes—			
Victoria Joyous Piebe	14,707	3·71	546
Victoria Woodcrest Daisy	15,160	3·53	536
Victoria Songstress	18,905	2·78	526
Victoria Belfry	13,646	3·71	507 (Jr. 3)
By Woodcrest Jo—			
Dominion Hyacinth	13,532	3·96	536
By Victoria Double Top—			
Victoria Ilkabelle	14,997	3·48	522 (Sr. 4)

Particulars of the Principal Herd Sires used in the "Victoria" Stud.

Name of Bull.	Period Used as Stud Sire.	Average Mature Equivalent Production of Tested Daughters.				Name of Sire.	Name of Dam.	Best Butter-fat Record of Dam in 273 days.
		No.	Milk.	Test.	Butter-fat.			
			lb.	%	lb.			
Victoria Joyous Mercedes	1927–1937	20*	12,940	3·61	466	D. Woodcrest Piebe Mercedes	V. Joybell ..	565 lb.
Victoria Topnote ..	1925–1931	11*	12,840	3·63	467	V. Songboy ..	D. Hyacinth ..	536 lb.
Victoria Double Top ..	1931–1936	9*	13,270	3·47	461	D. Oakdale ..	V. Top Patch ..	459 lb.
Dominion Oakdale ..	1918–1932	9	12,570	3·56	442	Oak de Kol 2nd Homestead Fobes	D. Ranee ..	Untested
Dominion Domino Dutch Boy	1918–1919	7	9,610	3·65	349	Longbeach Primrose League	D. Domino's Pride	468 lb. (N.Z.)
Victoria Jo Patch ..	1919–1923	7	11,760	3·82	397	L. Big Patch ..	D. Madrigal ..	448 lb. (Sr. 3)
Victoria Milkman Jo ..	1919–1922	3	11,190	3·50	392	Woodcrest Jo ..	D. Milkmaid ..	455 lb.
Victoria Songboy ..	1921–1923	2	17,270	3·34	584	D. Domino Dutch Boy	D. Madrigal ..	448 lb. (Sr. 3)
Victoria High Patch ..	1924	2	11,860	3·38	400	V. Jo Patch ..	D. Hyacinth ..	536 lb.
Dominion Woodcrest Piebe Mercedes	1925	1	15,150	3·14	476	Woodcrest Jo ..	D. Mutual Mercedes of Rock	438 lb. (N.Z., average six lactations)
Rupertswood Inka Jo ..	1935–1937	1*	14,100	3·46	488	Braemore Sylvia's Triumph	Ingolston Inka Josie	627 lb.
Anama Netherland Neptune	1937–1938	*a*				Totara Pontiac Daintyboy	A. Maggie's Winsome	628 lb.
Victoria Conductor ..	1938–	*a*				R. Inka Jo ..	V. Soprano ..	527 lb.
Victoria Ilka Jo ..	1938–1939	*a*				R. Inka Jo ..	V. Ilkabelle ..	522 lb. (Sr. 4)
Rupertswood Dutch Prince	1939–	*a*				Turepo Prince Domino	I. Domino Beauty	600 lb.
Terling Hypothesis ..	1940–	*a*				Terling Prometheus	Terling Eclipse 25th	573 lb. (England)
Victoria Maestro ..	1940–	*a*				Anama Netherland Neptune	Victoria Primadonna	414 lb. (Jr. 2)

* Incomplete. *a* Heifers not yet tested.

College, Sunbury. The use of this bull was a distinct outcross from the original foundation stock and a number of splendid heifers, most of which are now milking satisfactorily, were obtained from him before his untimely death. The present young herd sire, "V. Conductor," is by this bull. To fill the breach caused by the loss of "Rupertswood Inka Jo," Mr. W. Hawker, "Anama," Central Bungaree, South Australia, gave the Department his herd sire, "Anama Netherland Neptune," and there is now on hand a nice young bull by him from "Victoria Prima-donna," a daughter of the champion cow, "Victoria Songstress."

"Rupertswood Inka Jo"—the late herd sire. Dam—627 lb. butter-fat.

In January, 1939, a young bull, "Rupertswood Dutch Prince," was purchased from the Salesian College for mating to stock by "Rupertswood Inka Jo." The foundation stock, "Rupertswood Inka Jo," "Anama Netherland Neptune," "Rupertswood Dutch Prince" and "Terling Hypothesis" are all unrelated and this will introduce much outcrossing, the results of which, following the intense linebreeding, will be worthy of scientific investigation. Some of the present females contain the name of "Woodcrest Jo" at least ten times in their pedigrees, as well as being linebred to other distinguished ancestors.

Since the foundation of the "Victoria" stud, 267 production records have been completed in the Standard Herd Test by 92 different cows and heifers and, on 33 different

"Victoria Quilt"—Champion Melbourne Royal Show—586 lb. butter-fat.

[Continued on page 188.

Erosion Control

The Importance of Vegetative Cover

By J. Brake, B.Agr.Sc., Agricultural Superintendent.

Farming and general land use in Australia have reached a stage where it is necessary that a more intensive study of the soil and the problems associated with maintaining and improving its fertility is pursued.

The removal of soil from one place to another by the agency of wind or water is a natural process which has been going on since the world was formed. The rate at which it takes place varies considerably according to the climate, the nature of the soil, the vegetative cover and the general topography of the country.

Great losses from erosion have occurred in many other countries in the world, but it appears to be only comparatively recently that a large amount of damage has been regarded as preventable and that active steps have been taken to prevent the denudation of fertile country into desolate wastes, as has actually occurred in many of the older countries of the world.

The alarming degree to which damage was being done in the United States of America served to focus attention on this problem of soil erosion.

Here in Australia the damage, although extensive, is not of the same magnitude as in America, and it is only in the last two or three years that any definite attention has been given to the subject.

Wind erosion, or sand drift, has been recognized as a menace, particularly in South Australia and Victoria for many years, and in 1933 the Victorian Government appointed a Committee to investigate and report on sand drift and its control in the Victorian Mallee. Later in 1937 the Government appointed a Committee to investigate the whole problem of erosion in Victoria, the Chairman being Mr. W. McIlroy, the Secretary for Lands, with J. Brake, B.Agr.Sc., Agricultural Superintendent, Department of Agriculture; H. G. Strom, B.C.E., A.M.I.E., Aust., Divisional Engineer, State Rivers and Water Supply Commission; and Wm. J. Lakeland, M.B.E., A.M.I.E., Aust., Forest Engineer, Forests Commission, members.

This Committee inspected erosion damage in all parts of the State, and in February, 1938, issued a comprehensive report, copies of which may be had on application to the Department of Agriculture.

VEGETATION or land cover in erosion control is of double importance—firstly, as a soil holder, and secondly, as a soil builder. Leaves and branches of all kinds of plants, from lowly grasses to tall trees, check the pelting force of raindrops, whose disintegrating action on the soil is reduced to a minimum; on the surface the mulch of decomposing leaves, twigs, and stems prevents evaporation by soaking and temporarily checking the water as soon as it arrives, while underground, the maze of entangling roots holds the plants and soil in place, and the decayed roots leave passages for air and water. When these conditions are present, the result is an increasing supply of organic matter, more friability, and a higher absorptive capacity of the soil.

American experiments indicate that the soil is most susceptible to erosion when it is bare of vegetation. Also, that soils low in organic matter or of low fertility are more easily eroded than those high in organic matter and humus. Further, except on very gentle slopes, soil losses from water erosion are certain to occur if the soil is not held by ground cover.

The advantages of vegetation may be summarized as follows:—

1. It greatly reduces washing action of water on the soil.
2. It binds soil and prevents leaching out of plant food.

Trees provide excellent protection against erosion. [U.S.D.A.

3. It adds organic matter.
4. It releases mineral plant food.
5. It may provide feed in late autumn, winter, and early spring.
6. It maintains yields of subsequent crops.
7. It improves soil texture and increases water absorbing capacity.

Naturally, the effectiveness of vegetation in checking erosion varies greatly according to the type of plant, as to whether above ground it is bushy or sparse, and below ground as to whether it has a large mass of fine roots or a single tap root and whether it is deep or shallow rooting. The suitability of any particular kind or species of vegetation will vary also with the local conditions.

It is important, therefore, to know the relative effectiveness in the prevention of erosion of the various types of plants, and in America and Africa experiments have been carried out with the object of giving some indication of the amount of rainfall run-off from the fields under different crops, and also to determine the amounts of soil removed from similar land under different crops.

In one such experiment conducted at the Agricultural Experiment Station of the University of Missouri, U.S.A., seven plots, each 1/80th of an acre in area and elongated in form, were laid out on a loamy slope of

Erosion is not severe on many of the Gippsland hills.

3.68 ft. per 100. The plots were treated as follows :—

1. Uncultivated. Weeds pulled.
2. Cultivated 4 inches in spring, and after rains.
3. Cultivated 3 inches in spring, and after rains.
4. Dense pasture of blue grass.
5. Wheat annually.
6. Rotation—maize, wheat, clover.
7. Maize annually.

The average annual rainfall for the six years of the experiment was 35.87 inches. It was found that the average run-off of water varied from 48.92 per cent. of the rainfall on the uncultivated plot to 11.55 per cent. of the rainfall on the pasture plot. Pasture absorbed more water than cultivated land and lost .68 per cent as much soil as bare soil cultivated 4 inches deep.

Sheet erosion and gullying on pasture land.

On this evidence it may be estimated that if farm land should erode as rapidly as the soil in these experiments, the time taken to erode 7 inches of soil would be:—

Uncultivated—29 years.
Ploughed 4 inches— 24 years.
Ploughed 8 inches—28 years, or about 42 tons/ac. per annum.
Maize annually—56 years, or about 15 tons/ac. per annum.
Wheat annually—150 years, or about 9 tons/ac. per annum.
Rotation—maize, wheat, and clover—437 years, or about 3 tons/ac. per annum.
Dense pasture—3,547 years, or about ¼ ton/ac. per annum.

From these experiments it is evident that farmers can do much towards reducing run-off and the disastrous effects of erosion by rotating crops in such a way that the land will be covered with a growing crop for a large proportion of the time. The type of vegetation will vary according to the slope and nature of the soil.

Soil under crops with widely spaced rows, such as potatoes, is liable to be lost by erosion.

Soil Protecting Crops.

It is necessary to consider crops in order of their ability to protect soil, and we find a wide difference between them. Permanent pasture, lucerne, clover, and shrubs and trees with undergrowth will top the list. The least capable will prove to be crops planted in rows, such as potatoes, maize, tobacco, and vegetable crops and between those extremes we shall find an intermediate group, small grains such as oats, wheat, barley, and the various annual legumes.

Maize, potatoes, tobacco, and vegetable crops are usually planted in rows widely spaced, and the intervening soil is cultivated to kill weeds. This produces a fine tilth, often a dust mulch, which may be easily whisked away by rushing water. The so-called close-growing crops such as wheat, oats, rye, barley, and the various legumes are never inter-cultivated; but caution must be exercised even with these if the land is steep or if it does not absorb water readily. Under these conditions the drill rows should run on the contour.

The results of the investigations referred to above indicate as we might very well expect, that all vegetation and particularly first class pasture as soil cover rank very importantly as agents in the control of erosion. It should be noted that the words "first class pasture" are used. A poor pasture which has been grazed hard to ground level or which provides a very sparse cover for the ground because of the upright habit or of the small number of plants, could not be expected to offer much resistance to a flow of water over it and so be effective in erosion control.

Victorian Pastures and Erosion Control.

Topdressing and pasture management in Victoria have been widely practised and considerable improvement in methods has been effected in recent years, but there are still many instances where the regular provision of plant food by the application of fertilizers is not practised and general management is far from good. Probably because of the comparatively level nature of the arable land and of a large proportion of the pastoral country the menace of erosion in Victoria is not as great as is the case in U.S.A., but so far as the more hilly country is concerned, graziers could, with advantage, adopt some of the simple forms of erosion control which have given success in America, such as ridging and furrowing.

In light-rainfall pasture country, overstocking and improper seasonal use are common causes of erosion. Constant overgrazing thins the native species, reducing their value and opening up the sward. Grazed each spring before plant food is produced for continuous growth, the perennial grasses gradually give way before the competition of the shallow-rooted, quick-growing, but less valuable annual grasses and weeds. Plants of excellent soil-binding qualities are succeeded by plants of inferior soil-binding qualities.

Subterranean clover and topdressing with superphosphate, immensely valuable as they are in Victoria, do not help much in this connexion as the super. assists the aggressive sub. clover to outgrow and replace the native perennials in the spring, only to leave the ground comparatively bare in late summer, and exposed to the risk of blowing in very dry seasons or of water erosion if heavy rain should occur.

Close-growing crops, such as wheat, do not usually permit much erosion, but where it does occur even such crops as these should be sown on the contour.

Furrows placed across the slope on the contour prevent the too rapid run-off of water and induce a better growth of grass.
[U.S.D.A.

A fundamental principle of good pasture management, though one most difficult to practise, is the regulation of the number of stock carried to the grazing capacity of the property based on experience gained in *poor* to average years rather than in years *above average* in production.

Contour Farming.

In regard to mechanical aids to prevent water erosion and improve the sward, a common practice on gently sloping grazing land in America and one which has brought about great improvement in the grass by conserving moisture and controlling erosion, is to make small furrows exactly on the the contour at close intervals. These furrows not only hold up water and provide an entrance into the soil, but the movement of the water down the slopes is considerably slowed up and the water is also prevented from concentrating in the hollows, being spread evenly over the whole surface.

Thick grass soon grows adjacent to the furrow and acts as a filter, removing the mud in the water which would otherwise seal up the pores of the soil. Even if the furrow becomes almost obliterated, a miniature terrace is formed.

Any make or kind of disc plow with all but the back disc removed is perhaps the most suitable and convenient to construct furrows which should be about 6 to 8 inches wide, and 4 to 6 inches deep. A modification of the orthodox furrow has been developed to permit of the use of flood waters in the irrigation of pastures. Small pipes or weep holes are placed in the banks to permit small amounts of water to escape at regular intervals.

On more than gently sloping land it is doubtful if pasture contour furrowing would prove satisfactory by itself, except due to the extra penetration caused by the loose soil as the furrows would be inclined to fill rapidly and could not be constructed accurately enough to spread the water. The concentration which would take place would be liable to cause minor washes unless the volume of the water was restricted.

Here, the best-known practice is to construct normal type contour ridges on a very easy grade and place a few ploughed furrows at intervals on the exact contour between the contour ridges, or small contour ridges at close intervals. True "pasture contour ridges" are

Severe sheet and gully erosion on land planted to maize. Much of this could be prevented by planting along the contour.
[Sch. Agric. Penn.

Pasture contour furrows encourage increased growth of grass.

made fairly wide and about 1 foot high when first constructed, but the shape depends upon the slope of the ground. Very large contour ridges on the level with semi-closed ends have proved satisfactory on gentle slopes with porous soils. On less porous soils weep holes and spreaders might be included.

In any and every case when it is desired to cause more water to penetrate, every effort should be made to assist nature. As thick a cover as possible both of herbage and litter should be encouraged, thus slowing up the water and preventing the surface from becoming hard; further, the water will not be muddy to choke the pores of the soil, but clean and able to penetrate. There is a great difference between the rates of penetration of clean and turbid water. Evaporation will be reduced.

Rest the pasture and stop fires. Without some rest or reduction in stock, mechanical treatment—i.e., contouring, furrowing, &c.,—brings slow benefits, but combined with a short rest, remarkable results can be obtained.

Enough has been said to indicate that the important thing in the use of pasture for erosion control is the development and maintenance of a dense sward. Management should be directed towards the preservation of a number of species, perennial and annual, in order to ensure that an all-the-year-round cover may be maintained. Pasture with a thin sward is a poor preventive of erosion.

The recognition and practice of the principles mentioned above and the use of species suitable to our climatic and soil conditions may be expected to practically free us from erosion worries. The increasing use of perennial rye grass, cocksfoot, Phalaris tuberosa, white and subterranean clovers, Kentucky blue grass, tall fescue, paspalum and other species according to prevailing conditions, will safeguard that large proportion of our grazing land which may be regarded as less susceptible to erosion, while for the poorer soils of the hills and the granite country, the reclamation of gullies and treatments of special cases, other species such as the couches, kikuyu, paspalum, and the bent grasses are available.

The provision of grasses and clovers for drift prevention in the Mallee and also for the Wimmera is not easy, but in recent years the Department of Agriculture has made considerable

progress in that connexion in determining the suitability of species at the Mallee Research Station, at Walpeup, where encouraging results have been obtained from Wimmera rye grass, veldt grass, barrel medick, Mulwala clover, and lucerne.

In the 14 inch to 17 inch rainfall wheat-growing country, including the southern Mallee lucerne (notwithstanding setbacks from wind erosion) is giving most promising results on fringe Mallee and limestone soils, proving itself to be an excellent, dry farming plant. Probably because of its splendid growth under irrigation, lucerne has not been generally regarded in the past as suitable for dry conditions; this impression has apparently been caused by its failure to come up to the unreasonable expectation of making the same luxuriant growth under dry conditions as it does when irrigated.

Illustrating the effective control of erosion by the use of vegetation in practical farming in America. Strips of close growing crops divide the more open growing crops, all being planted across the slope on the contour. Timber and undergrowth are encouraged on the hill tops and in the bottoms of the gullies. [U.S.D.A.

Selection of Plants.

The selection of pasture plants for the control of erosion will be governed very definitely by the conditions under which they are to be grown. These conditions can be segregated into the following divisions:—

1. Permanent swards in heavier rainfall areas.
2. Inland sand under arid conditions.
3. Coastal sand and salty soils.
4. Banks of gullies.
5. The bottoms of gullies.
6. The banks of streams and swamps.

Let us deal with each of these in turn:—

For Permanent Swards in Heavier Rainfall Areas the commonly sown species are suitable, according to the prevailing environmental conditions, such as—

Perennial rye-grass.
Cocksfoot.
Phalaris tuberosa.
Kentucky blue grass.
Tall fescue.
Paspalum dilatatum.
White clover and Subterranean clover.

For use on Inland Sand Dunes the species found suitable will vary according to the rainfall. Kikuyu and buffalo grass will be found useful where the rainfall is 18 inches to 20 inches or over, while marram grass, Wimmera rye, lucerne, and veldt grass have proved themselves in districts of 14 to 20 inch rainfall with pyp grass, blue lupin, burr medick, barrel medick, and evening primrose giving promising results where the rainfall is about 14 inches per annum.

For Binding Coastal Sand there are available, sand lyme grass, salt grass and coast rat tail grass for the more salty soils, while on those soils of moderate to low salinity, spinnifex, marram grass, kikuyu, longstyled feather grass, couch and sorrel may be used.

Banks of Gullies may be held with bent grasses, either creeping or white bent, English couch, kikuyu, buffalo, paspalum, phalaris, Kentucky blue, or mat grass.

In Wetter Places such as in the bottoms of the gullies, species are available such as white bent, water couch, reed canary grass, and greater bird's-foot trefoil.

For Binding the Banks of Streams.—For the wetter places: Common reed, *Poa aquatica,* or greater bird's-foot trefoil may be used, while on the sides and tops of the banks, creeping and white bents, kikuyu species similar to those enumerated above for use on banks of gullies are suitable.

To sum up, a cover of vegetation on the ground is the natural way—*Nature's Way*—not only of protecting the soil from erosive action, of wind, and water, but also of maintaining its fertility. The different types of cover, forest, shrubs, and crops vary in effectiveness in this regard with permanent pasture taking pride of place as the real soil builder.

A healthy grass sward breaks down the destructive force of water and wind and, underground, produces new roots each year, discarding the old roots, as organic matter for the soil.

The menace of erosion on Victorian pastures varies considerably in different districts. Very extensive damage has not as yet occurred, and the danger does not appear to be so great on a large proportion of the pastoral country of Gippsland and the Western district, but on the other hand, large grazing areas of the central highlands and mountainous North-east country have been, and are still being, severely eroded.

It is necessary that *every* person charged with the management of land, no matter in what district, should be fully informed on erosion control methods; but the condition referred to in the higher land of the State is particularly serious, *often* because of the destruction of the land itself, but *always* because of the indirect damage to streams and water storages by siltation, which, notwithstanding good work already being done in this connexion by the State Rivers and Water Supply Commission, is a very serious aspect of soil erosion in Victoria.

May I conclude with this statement: The general position in Victoria calls for further definite attention to ensure that all land owners are supplied with sound advice to assist them in retaining a dense vegetative cover on the larger proportion of the land of the State.

Sowing Flax for Fibre

(*Continued from page* 167)

Fertilizers.

Trials conducted by the Department of Agriculture have shown that flax generally responds to superphosphate, and a normal dressing of 1 cwt. per acre is recommended. Where flax is sown on rich soil after heavily-manured potatoes, it may be advisable to use a smaller quantity of superphosphate or even no manure, to avoid the risk of a rank crop which might lodge. Similarly, on any rich soil where a strong growth could be expected, as at Strathkellar, it would be wise to reduce the manurial dressing to ½ cwt. per acre, especially with early sowing, having in mind that it is better to have a 2-ton crop of standing flax than a 2½-ton crop lodged. With late sowing, the dressing could be increased. Muriate of potash and sulphate of ammonia combined with superphosphate have been tried over the past three years, without sufficient success to warrant their use.

Weeds.

Should any troublesome weeds appear as the crop is growing, it is always advisable, and sometimes necessary, for the grower to walk through the flax when it is young and remove the weeds by hoeing or by hand pulling. This may save dockage later on or may make the crop eligible for any bonus given for particularly clean crops.

Burnley Egg-Laying Competition

Results for 1939-40

By H. F. Clinton, Poultry Expert

THE weather conditions generally, throughout the twenty-ninth Egg-laying Competition for fowls, conducted at the Burnley School of Primary Agriculture and Horticulture, were favorable for egg production. That the average egg production on commercial poultry farms can be greatly improved by the introduction of stock related to those birds entered by successful competitors is recognized, and, therefore, the Department of Agriculture, renders a distinct service to the industry by conducting these competitions for breeders on their behalf. For this reason it is pleasing to note that the competitions continue to be well supported by breeders, as all the pens in the competition just concluded were filled. Some well-known competitors were conspicuous amongst the prize winners, and several very high scores were recorded. Taking everything into consideration the competition, which is conducted over a period of 48 weeks (1st April, 1939, to 1st March, 1940, was a most successful one.

The Burnley Competitions commenced in 1911, and the highest number of first-grade eggs laid by a team of six birds was that established by Mr. J. Herbert's team of six Australorps, during the twelve months ending 31st March, 1939—his birds having laid 1,734 first-grade eggs. Again, this year, Mr. Herbert entered another team of six Australorps, which has put up another remarkable performance by laying a highly creditable score of 1,665 first-grade eggs up to 1st March (48 weeks). This feat qualified them to be retained until 31st March in order to see if the previous record for twelve months (established last year by Mr. Herbert's team of Australorps) could be beaten. This team went on to lay 1,788 first-grade eggs, and exceeded the previous Burnley record for all breeds by 54. This was a fine performance.

Mr. J. Chatt's prize winning Australorp which laid 295 first-grade eggs.

Mr. F. W. Becker's team of six White Leghorns in the Wet Mash Section also qualified to be retained for the full twelve months, the birds having laid 1,632 first-grade eggs up to 1st March, another outstanding performance, and the second highest score in Section A. By 31st March, this team had laid 1,719 first-grade eggs, twenty more than the previous Burnley record for a team of White Leghorns, established in 1914-15 by Mr. W. N. O'Mullane's birds.

The highest number of eggs laid by a single bird for twelve months since the commencement of the Burnley Competitions was that recorded in 1923-24 by a Black Orpington (now Australorp) owned by Mr. W. Cullen. This bird laid 338 eggs (last egg weighed 2 7/16 oz.).

In the competition just concluded, another remarkable performance was put up by Mr. D. Granter's White Leghorn in the Dry Mash Section. This bird laid 310 eggs, all first-grade, in the 48 weeks up to the 1st March,

and therefore qualified to be retained for another month. It laid another four eggs only and thus did not break the previous Burnley record (338) for a single bird of any breed.

Approximately 300 visitors attended the poultry farmers' field day at the Burnley Gardens on Saturday afternoon, 2nd March, 1940, when the opportunity was taken to inspect the prize winners and other competition birds at the conclusion of the 1939-40 competition. Short talks were given by departmental officers, and an exhibit of poultry appliances, records, foods, and eggs was displayed in the pavilion. The field day is held at the conclusion of the competition each year. The day proved to be a most successful and enjoyable one, largely due to the assistance rendered by the National Utility Poultry Breeders' Association, Victorian Branch, representatives of poultry organizations and visitors from country districts, and to the great number of competitors and supporters of the Burnley Competition.

This year, in conjunction with the poultry farmers' field day at Burnley, the Department also staged a non-competitive exhibition of male birds, the property of competitors, and of the same strain as the birds entered in the competition. This feature should gain keen support

A White Leghorn owned by Mr. H. Lyon. This bird gained first place in the wet mash section for its breed with a score of 275 first-grade eggs.

TABLE SHOWING MONTHLY LAYING RETURNS.

Month.	Light Breeds.						Heavy Breeds.					
	White Leghorns.			Other Light Breeds.			Australorps.			Other Heavy Breeds.		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.
					Section A.							
April	228	2,939	12·9	..	..	..	126	1,807	14·3	66	655	9·9
May	228	2,618	11·5	..	..	..	126	2,003	15·9	66	670	10·2
June	226	2,696	11·9	..	..	..	125	1,943	15·5	65	697	10·7
July	225	3,389	15·0	..	..	..	124	2,152	17·4	64	829	13·0
August	224	4,241	18·9	..	..	..	124	2,648	21·4	63	1,094	17·4
September ..	222	4,894	22·0	..	..	..	122	2,591	22·2	63	1,313	20·8
October	221	5,001	22·6	..	..	..	121	2,663	22·0	63	1,364	21·5
November ..	221	4,654	21·1	..	..	..	121	2,258	18·7	63	1,149	18·2
December ..	218	4,491	20·6	..	..	..	118	2,083	17·7	63	1,025	16·3
January	215	4,312	20·1	..	..	..	115	1,860	16·2	62	864	13·9
February ..	215	3,767	17·5	..	..	..	114	1,802	15·8	62	793	12·8
					Section B.							
April	120	1,585	13·2	6	7	1·2	58	858	14·8	38	361	9·5
May	120	2,583	21·5	6	15	2·5	58	1,107	19·1	38	598	15·7
June	119	1,833	15·4	6	19	3·2	57	1,241	21·8	38	641	16·9
July	118	1,928	16·3	6	43	7·2	57	1,134	19·9	38	563	14·8
August	118	2,252	19·1	6	93	15·5	57	1,170	20·5	38	697	18·3
September ..	118	2,857	24·2	6	111	18·5	57	1,595	28·0	38	827	21·8
October	117	2,882	24·6	5	120	24·0	57	1,375	24·1	38	862	22·7
November ..	116	2,632	22·7	5	57	11·4	57	1,214	21·3	38	639	16·8
December ..	114	2,481	21·8	5	63	12·6	56	1,170	20·9	38	633	16·7
January	112	2,415	21·6	5	49	9·8	56	1,024	18·3	38	610	16·1
February ..	110	1,745	15·9	5	40	8·0	54	851	15·8	38	497	13·1

Mr. F. W. Becker's winning team of White Leghorns (Dry Mash) which laid 1,526 first-grade eggs.

each year. It provides a most interesting and educational show, by means of which many visiting poultry farmers can inspect the actual type of male birds used for breeding purposes by those who take part in the annual laying tests. In all there were 21 male birds exhibited by the following competitors:—

White Leghorns.—Messrs. E. Abikhair, F. W. Becker, A. R. Davey, C. Gowers, H. Lyon, F. C. Mason, and Squirrell Bros.

Australorps.—Messrs. J. Chatts, J. T. Cornish, J. Herbert, F. C. Mason, L. J. Mumford, P. Phelan, W. A. Shevill, and R. S. Youl.

Rhode Island Reds.—Messrs. J. Chatts, H. Dibbs, Milledge Bros., J. Rankin, W. Tedstone, and R. H. Woods.

It is pleasing to note the keen interest that is still being taken in Rhode Island Reds in Victoria. In all, 96 Rhode Island Reds competed in the competition just concluded—the highest number of this breed that has ever competed in a Burnley Competition, or in any Government competition in Australia.

The extent of mortality among the competing birds was 7.6 per cent. It is in the interest of all poultry breeders to improve their flocks and reduce mortality, therefore, competitors should exercise special care in the selection of the stock used to produce birds for egg-laying competitions, and breed only from those possessing a high degree of constitutional vigour. It is pleasing to be able to state that only three deaths occurred from heat apoplexy. This is low compared with the previous competition, when seventeen birds were lost through this cause during the excessive heat wave that occurred during that season.

The average number of eggs produced by the fowls compared with that of the last four years continues to be highly satisfactory, as can be seen from the following table:—

Average Number of Eggs Laid per Bird.

Competition. (48 weeks.)	First Grade.	Under-weight.	Total.
1935–36..	176·8	7·8	184·6
1936–37..	183·7	4·4	188·1
1937–38..	190·3	2·9	193·2
1938–39..	190·2	4·9	195·1
1939–40..	188·0	3·9	191·9

The following table, which sets out the percentages of first-grade eggs, underweight eggs, mortality, &c., during the past fifteen years is also of interest:—

SHOWING THE IMPROVEMENT IN PERCENTAGE OF FIRST-GRADE EGGS, 1925-26 to 1939-40.

Year.	Percentage of First-Grade Eggs.	Percentage of Underweight Eggs.	Average Number of Eggs per Bird.	Percentage Mortality.
1925–26*	79·8	20·2	206·3	5·4
1926–27	86·0	14·0	202·3	3·9
1927–28	88·4	11·6	197·8	4·2
1928–29	90·8	9·2	199·0	6·7
1929–30	89·9	10·1	187·3	4·3
1930–31	90·3	9·7	193·3	6·4
1931–32	92·6	7·4	195·2	5·1
1932–33	93·6	6·4	189·9	5·5
1933–34	93·5	6·5	185·1	7·7
1934–35	94·7	5·3	186·4	6·4
1935–36	95·8	4·2	184·6	8·9
1936–37	97·6	2·4	188·1	6·1
1937–38	98·5	1·5	193·2	6·6
1938–39	97·5	2·5	195·1	8·9
1939–40	98·0	2·0	191·9	7·6

* The 1925–26 competition was conducted over a period of 52 weeks, all other competitions 48 weeks.

Miss V. Graham's White Leghorn which laid 231 first-grade eggs.

A special section was again provided this year for members of Young Farmers' Clubs. It was decided also to award prize certificates for the birds laying the greatest weight of eggs.

In the competition just concluded prize certificates and sashes were awarded for the greatest number of first-grade eggs laid. During

STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD.

Breeds.	No. of Birds. After Allowing for Deaths.	Eggs Laid.			Average Number of Eggs Laid per Bird.		
		1st Grade.	Underweight.	Total.	1st Grade.	Underweight.	Total.
LIGHT BREEDS—WET MASH—							
White Leghorns	242	46,940	1,353	48,293	193·9	5·5	199·4
White Leghorns—Young Farmers' Clubs	6	915	18	933	152·5	3·0	155·5
Brown Leghorns	6	609	11	620	101·5	1·8	103·3
TOTAL LIGHT BREEDS—WET MASH	254	48,464	1,382	49,846	190·8	5·4	196·2
LIGHT BREEDS—DRY MASH—							
White Leghorns	98	18,961	200	19,161	193·5	2·0	195·5
TOTAL LIGHT BREEDS—WET AND DRY MASH	352	67,425	1,582	69,007	191·5	4·5	196·0
HEAVY BREEDS—WET MASH—							
Australorps	179	35,006	780	35,786	195·6	4·4	200·0
Rhode Island Reds	94	15,307	97	15,404	162·8	1·0	163·8
Rhode Island Whites	2	265	..	265	132·5	..	132·5
White Wyandottes	4	901	21	922	225·3	5·2	230·5
Light Sussex	6	789	1	790	131·3	..	131·3
Australorps—Young Farmers' Clubs	4	859	6	865	214·7	1·5	216·2
TOTAL HEAVY BREEDS	289	53,127	905	54,032	183·8	3·1	186·9
TOTAL ALL BREEDS—WET AND DRY MASH	641	120,552	2,487	123,039	188·0	3·9	191·9

the first two months of the competition a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz. At Burnley every egg is weighed, and each bird is also weighed at the commencement and conclusion of the competition. These records are available for examination by any competitor.

The Awards.

TEAMS OF SIX.

In Section A, Class 1, White Leghorns, Wet Mash, Mr. F. W. Becker, who won first prize in this class last year, was again successful and he gained a second prize Burnley Sash, with a team that laid 1,632 first-grade eggs—the second highest score recorded in Section A. This was a team of strong, typical birds, and they laid consistently throughout the test. The eggs laid were of a large size and of good quality. As mentioned previously, these birds were retained for the full twelve months and laid 1,719 first-grade eggs. Messrs. C. Gowers and L. Magnusson were awarded equal second prize, each of their teams having laid 1,296 eggs. A bird in Mr. Becker's winning team in this class laid 290 first-grade eggs.

In Class 2, White Leghorns, Dry Mash, first prize and a third prize Burnley Sash went to Mr. F. W. Becker, with a team that laid 1,526 first-grade eggs. This was a strong, vigorous team, and it produced a very good score. The eggs were of a good size, shape, and texture of shell. There was an increase in the weight of the birds of $9\frac{2}{3}$ oz. per bird. Mr. C. R. Fagg, who won in this class last year, gained second prize with 1,237 eggs, and Mr. W. P. de Hugard followed closely for third prize with 1,235 eggs, only two eggs less. A bird in Mr. Becker's winning team in this class laid 270 first-grade eggs.

Visitors at the poultry farmers' field day held at Burnley early in March.

In Class 4, Australorps, Mr. J. Herbert won first prize and a Burnley Champion Sash with a team that laid a total of 1,665 first-grade eggs —the highest score in all classes of Section A.

A Rhode Island Red team, owned by Mr. S. N. Lloyd, which laid 1,245 first-grade eggs.

An Australorp entered in the Young Farmers' Club section by Miss F. Rhodes. This bird laid 240 first-grade eggs.

As mentioned previously these birds were retained for the full twelve months, and exceeded the previous record in the number of eggs laid. This was a very strong team, and one of excellent quality. The eggs were of a good size, shape, and texture of shell, and fairly even in colour. There was an increase in weight of the birds of 7⅛ oz. per bird. Mr. W. A. Shevill, who won second prize in this class last year, was awarded second and third prizes with teams that laid 1,332 and 1,331 eggs respectively. A bird in Mr. Herbert's winning team in this class laid 303 first-grade eggs, the highest score recorded by an individual bird in all classes of Section A.

In Class 5, Rhode Island Reds, Mr. S. N. Lloyd was awarded first prize for a team that laid 1,245 first-grade eggs. This was a good team of fairly typical birds, of a good colour, and the eggs laid were of a good size, shape, colour and texture of shell. There was an increase in the weight of the birds of approximately 15 oz. per bird. Mr. J. Rankin's team won second prize with 1,192 eggs, while Mr. J. Chatts was awarded third prize with 1,126 eggs. A bird in Mr. S. N. Lloyd's winning team in this class laid 255 first-grade eggs.

Individual Birds.

In Section B, Class 1, White Leghorns, Wet Mash, first prize was won by Mr. H. Lyon with a bird that laid 275 first-grade eggs. This was a good quality bird, hard in feather, fairly typical of the breed, and it finished the test in good condition. It increased 5 oz. in weight. Messrs. Trewin and Graham followed closely for second prize with a total of 272 first-grade eggs, only three eggs behind the first prize bird, while Mr. J. H. Wernli followed for third prize with 265 eggs.

In Class 2, White Leghorns, Dry Mash, first prize and a Burnley Champion Sash was won by Mr. D. Granter, with a bird that laid 310 first-grade eggs, the highest score recorded by any individual bird in both Sections A and B. As mentioned previously this bird was retained for the full twelve months, and laid 314 first-grade eggs. It was a very typical and strong bird, with a particularly good head. The eggs laid were very good, and of a satisfactory size, shape, and texture of shell. The bird increased 10.0 oz. in weight. Mr. L. F. Werrett won second and third prizes with birds that laid 276 and 267 eggs respectively.

In Class 4, Australorps, first prize and a second prize Burnley Sash was won by Mr. J. Chatts, with a bird that returned a particularly good score of 295 first-grade eggs, the second highest number recorded in Section B. This was a strong and typical specimen of her breed, well balanced, of good feather quality, and it finished the test in excellent condition. The eggs were of excellent quality, large in size, and of a good shape, colour, and texture of shell. There was an increase in weight of this bird of 1 lb. 13 oz. Messrs. Aitken and Grenville gained second prize and a third prize Burnley Sash with a total of 286 eggs, nine eggs behind the winning bird, and Messrs. D. and J. Tresise's bird was third with 271 eggs.

In the class for Rhode Islands, Mr. L. Snibson won first prize with a Rhode Island Red that laid 279 first-grade eggs. This was a strong, typical, and close-feathered bird of good quality. The eggs were of a good size, shape, colour, and texture of shell. The bird increased 12 oz. in weight. Second prize was secured by Mr. H. Chalmers with a Rhode Island Red that laid 257 eggs, while Mr. G. Winter obtained third prize with a Rhode Island Red which laid 234 eggs.

Mr. D. Granter's White Wyandotte which laid 257 first-grade eggs.

Mr. D. Granter won first prize in the class for All Heavy Breeds other than Australorps and Rhode Islands with a White Wyandotte that laid 257 first-grade eggs. This was a fairly typical bird that laid well and consistently throughout the test, and finished in very good condition. The increase in weight of this bird was 1 lb. 12 oz. Mr. J. Granter secured second prize with a White Wyandotte that laid 256 eggs, only one egg behind the winner. Mr. Granter's winning White Wyandotte in this class has laid the highest score recorded for this breed in any Burnley Competition in 48 weeks.

Greatest Weight of Eggs.

For individual birds in both Sections A and B, that laid the greatest weight of eggs, Mr. D. Granter won first prize with a White Leghorn that laid 310 eggs, weighing 688.6 oz. (43 lb. 0.6 oz.). Second prize was secured by Mr. J. Chatts with an Australorp that laid 295 eggs, weighing 671.2 oz. (41 lb. 15.2 oz.); and Mr. J. Herbert was third with an Australorp that laid 293 eggs, weighing 641 oz. (40 lb. 1 oz.). The number of eggs shown above was the total number laid by each of these birds, and they were all first-grade.

Young Farmers' Clubs.

In the Young Farmers' Clubs Section, Class 1, White Leghorns, Wet Mash, Miss Verna Graham (Coimadai) won first prize with a bird that laid 231 first-grade eggs. This was a good strong bird, fairly typical of the breed, and it finished the test in very good condition. The bird increased 11 oz. in weight. In Class 2, Australorps, Wet Mash, Miss Flora Rhodes (Mickleham) won first prize with a bird that laid 240 first-grade eggs. This was a strong bird, and the eggs laid were of a good size, shape, colour, and texture of shell. This bird increased 4 oz. in weight. Miss Marjorie Parker (Mickleham) obtained second prize with a bird that laid 227 eggs.

Weights of Winning Birds.

The weights at the beginning and at the end of the competition of those birds laying the greatest number of eggs are as follow:—

—	Bird No.	Weights at April, 1939.	Weights at March, 1940.	First Grade Eggs.
		lb. oz.	lb. oz.	
Section "A"—Teams of Six Birds.				
Light Breeds.				
F. W. Becker's White Leghorns (Pen 3)	13	4 3	Moulted	279
			3 14	(280)
	14	4 8	Died	277
			5.3.40	(279)
	15	4 6	5 2	290
				(310)
	16	4 9	4 12	252
				(273)
	17	4 2	4 15	252
				(273)
	18	4 11	5 3	282
				(304)
Heavy Breeds.				
J. Herbert's Australorps (Pen 55)	325	5 15	6 0	246
				(267)
	326	6 0	6 8	293
				(313)
	327	4 15	4 11	284
				(306)
	328	4 14	5 2	281
				(301)
	329	4 12	5 6	303
				(323)
	330	5 4	6 12	258
				(278)
Section "B"—Individual Birds.				
Light Breeds.				
D. Granter's White Leghorn	216	5 0	5 10	310
				(314)
Heavy Breeds.				
J. Chatts' Australorp	103	5 1	6 14	295

Birds belonging to F. W. Becker, J. Herbert, and D. Granter were retained for 12 months, and the number of first-grade eggs laid for this period is shown in brackets.

Cost of Feeding, &c.

The number of fowls in the competition at its beginning was 656, but 50 of these died. The total number of days these latter birds collectively were in the pens was 11,617, which is equal to approximately 35 birds having been there for the full 48 weeks. Therefore, the total number of birds in the competition for the whole period may be regarded as 641, and this is the figure that has been used in working out averages, &c.

The different kinds and quantities of the food fed to the birds during the currency of the competition were as follows:—Wheat, 22,576 lb.; hulled oats, 5,703 lb.; cracked maize, 5,709 lb.; bran, 14,662 lb.; pollard, 23,894 lb.; pea meal, 142 lb.; meatmeal, 264 lb.; dried whey, 265 lb.; meat, 3,517 lb.; onions, 295 lb.; grit, 2,925 lb.; salt, 208 lb.; charcoal, 208 lb.

The total number of eggs laid, including those underweight was 123,039, an average per bird of 191.948 for the 48 weeks.

The price realized for the eggs averaged 1s. 2¼d. per dozen. The market value of the eggs averaged 19s. per bird, and the cost of food averaged 6s. 10¼d. per bird, a fraction under 1¾d. per week; thus, the profit over cost of food for the 48 weeks averaged 12s. 1¾d. per bird.

The prices received for the eggs, however, are the net prices, exclusive of freight or commission charges, &c. Also, it must be remembered that the eggs were laid by pullets in their first period of production, which were kept in single pens or in teams of six, the conditions being entirely different from those on commercial farms where birds of various ages are kept in large flocks.

The successful results achieved in the competition pens are due to good feeding and management and the high average production of eggs of good quality, size, shape, colour, and texture of shell from birds of high quality and constitutional vigor. When birds of this description are returned to their owners they can be used to breed stock of the highest class. That there is a keen demand for birds of the right kind is shown by the very high prices that have been paid for the best stock entered in the Burnley Egg-laying Competitions. Owners of commercial poultry farms, by introducing birds of this description amongst their flocks, no doubt would greatly improve their average egg yield and reduce the percentage of mortality on the farm.

Competitors entering birds are advised to select only pullets bred from strong robust parents that have not suffered an illness of any description. It is only those birds, bred with a high degree of constitutional vigor, that can produce progeny which stand the strain of high egg production over a long period.

The "Victoria" Friesian Stud—(*Continued from page 172*)

occasions, fifteen cows have produced over 500 lb. butter-fat in the 273 days, while another thirteen cows have exceeded 500 lb. butter-fat during the full lactation period.

There has always been a keen demand for bull calves and surplus females from the stud and, in this respect, orders have been supplied for clients in all the Australian States, India and China. Members of the stud have always competed successfully with other stock at the Melbourne Royal Show, and to date over 40 prizes, including three Champion, five Reserve Champion, and eleven First Prizes have been won with bulls, and over 108 prizes, including four Champion, three Reserve Champion, and 35 First Prizes with cows.

At present there are 45 females and twelve bulls, including calves, in the "Victoria" stud.

Average Producton of Friesian Herd since 1927-28.

Year.	Number of Cows in Test.	Milk.	Test.	Butter-fat.	Butter-fat lb. with allowances for Heifers.
		lb.	%	lb.	
1927–28	14	9,177	3·67	336·85	399·21
1928–29	10	13,644	3·41	456·24	512·74
1929–30	10	11,831	3·40	399·45	456·95
1930–31	13	12,763	3·43	431·92	500·01
1931–32	10	10,116	3·69	369·00	417·00
1932–33	10	10,512	3·65	378·03	434·03
1933–34	15	11,891	3·61	427·41	496·24
1934–35	13	11,309	3·79	426·22	483·49
1935–36	18	11,022	3·47	383·35	456·79
1936–37	15	11,423	3·52	401·17	446·50
1937–38	15	11,441	3·57	505·99	461·99
1938–39	18	12,023	3·56	420·04	458·21
1939–40	13*	10,660	3·54	376·16	433·08
Average for twelve years, 176 cows		11,377	3·55	395·75	459·60

* Incomplete.

Live Stock Notes

Reminders for April—May

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Shortage of Bran and Pollard.

CONCERN is being felt by a very large number of dairy, pig, and poultry farmers over the present scarcity of bran and pollard. There are many well-known substitutes for those two commodities, the most useful being ground wheat, barley and oats. In truck lots wheat and barley may be procured direct from the appropriate Commonwealth Boards at 4s. 2d. a bushel in the case of wheat, and 2s. 3d. for barley. But few farmers are able to buy a truck load at a time, mainly because they have neither the ready cash nor adequate storage facilities.

The shortage of bran and pollard is due to the fact that millers already have on hand large stocks of flour for export, but for which shipping space is unavailable, and practically the only wheat being gristed is that required for local flour consumption.

With bran and pollard almost unprocurable, substitutes must be purchased to take their place, and these substitutes will vary slightly with the class of stock being fed. Small quantities of bran and pollard will always be available, and it is recommended that substitutes be used as far as possible with the available bran and pollard to make up deficiencies in these two commodities, more especially so far as poultry is concerned.

Substitutes for bran and pollard in the rations for dairy cows can be fairly easily arranged, because the cow is able to deal with such a large range of fodders in her digestive system. With cows the best substitutes for bran are dried brewers' grains, polly feed and good lucerne chaff, or mixtures of these commodities with an equal quantity of crushed oats. Dried brewers' grains or lucerne chaff will displace bran on a pound for pound basis, but approximately 2 lb. of polly feed or crushed oats will be equal to 3 lb. of bran.

Substitutes such as ground wheat, barley, or oats for pollard in a milking cow's ration require the addition of some protein-rich supplement such as meat meal, peanut meal, or linseed meal. Excellent results can be expected from mixtures containing 5 parts of ground grain and 1 part of meat meal or 10 parts of ground grain, 1 part of meat meal and 1 part of linseed or peanut meal.

On farms where green pastures, green summer crops or fresh brewers' grains are available, pollard or the recommended substitutes can be used as the sole concentrate, bran or its substitutes being unnecessary.

Substitutes for bran and pollard can also be fairly easily arranged for pigs and at present wholesale prices, a mixture of 3 parts of ground barley and 1 part of ground oats with skim milk or meat meal, makes the cheapest ration, and is being recommended by Mr. L. A. Downey, the Pig Expert of the Department.

Dairy Cattle.

With the approach of cold weather, following a dry autumn and a subsequent shortage of feed, supplementary feeding of dairy cattle, if not already being done, will need to be commenced before the cows drop too much in their milk yields or lose too much condition. The use of grass, lucerne, and oaten hay or silage is recommended as the cheapest form of supplementary feed. Where concentrates are required, mixtures of crushed oats and barley with brewers' grains, meat, linseed or peanut meals can be used to replace all or portion of the usual rations of bran and pollard. The cows, calving during the autumn, will show most response to supplementary feeding, and should be fed in such a way that they will milk well right through the winter.

Springers and newly-weaned heifers will require more attention and supplementary feeding wherever the natural feed is insufficient to supply all of their food requirements.

The dairy farmer should go through his herd and cull out all those animals which are not producing economically, and which will not be required next year. On most farms it is

best to sell the culls immediately, because, if held, they will graze pasture and eat fodders which are required, and can be put to more profitable use by the milking herd.

In districts where autumn calving is usual, any new herd sires will need to be selected now for mating to the cows and heifers at the end of May.

This is a very opportune time of the year to make improvements to the dairy buildings, concrete cow yards, repair and clean drains leading from the cow yards and lanes, and add appropriate filling wherever required. Everything should be done to avoid winter mud, because mud not only affects the milk yield, health and condition of the cows, but it also increases the work of the farmer and tends to make dairy farming an unpleasant occupation.

Poultry.

The scarcity of bran and pollard makes it necessary to feed substitute fodders to poultry. Much difficulty is experienced in computing rations which do not contain bran and pollard and yet retain the texture of a bran and pollard mash without raising the fibre content unduly, since fowls are unable to digest fibre. It is therefore recommended to use some bran and pollard, particularly bran, when available.

To meet the present conditions and replace the usual wet and dry mash, the poultry expert, Mr. H. F. Clinton, recommends a mash made as follows (parts by weight) :—

6 parts ground grain (either wheat, barley, equal parts of wheat and barley, or equal parts of wheat, barley, and oats).
1 part bran or dried brewers' grains.
2 parts meat meal.
1 part dried milk.

This mash could be improved by displacing some of the ground grain with pollard or by using 5 parts of ground grain and 2 parts of bran, and fed in conjunction with greenstuff and whole grain.

Birds required for breeding purposes should already have been selected, and should be fed with a liberal supply of grain, especially oats of good quality, in preparation for the breeding season. The remainder of the cull birds should be disposed of as soon as possible. Strict sanitary conditions must be observed in all operations of poultry farming.

Sheep.

The early lambs will make their appearance in April, and lambing will continue through the winter and, in late districts, will be completed during the spring. Lambing ewes should be kept in good, strong store condition, as they produce more and better lambs with a reduced mortality than ewes which are excessively fat or in weak condition. Prior to lambing it is advisable to go among the ewes as much as possible, so that they will become accustomed to the presence of their owner or attendant. Only well-trained, silent, wide-working dogs should be permitted among lambing ewes. During the lambing period careful attention should be given to the flock at least twice every day, early morning and late afternoon being the best times. Where supplementary feeding is necessary oats and lucerne-hay are recommended. There are good supplies of these commodities at reasonable prices. (Mr. N. A. Bowman is the Sheep and Wool Expert of the Department).

Horses.

The Senior Veterinary Officer, Mr. W. D. Shew, advises that, with the approach of winter, horses at work may be given an increased and more stimulating ration. Stabled horses are better clipped, except for the legs. Working horses, not stabled, should also be clipped and fitted with a good type of waterproof canvas rug. All horses, of course, must be groomed thoroughly every day, especially those being rugged. The rugs, too, should be brushed daily on the underside.

Horses at pasture should have their feet regularly trimmed, and, before the winter and when necessary, their teeth should receive veterinary attention. Regular dental examinations are essential to keep horses sound and well.

Weaned foals should have plenty of nourishment; excellent additions to their diet are half a pound of crushed oats, together with a tablespoonful of di-calcic phosphate and, if succulent pastures are not available, two tablespoonfuls of cod liver oil or pilchardine in a little damped bran and chaff should be added to the ration twice daily.

Bees.

All hives should be examined during April to see that there is sufficient sealed honey, between 25 and 40 lb. per hive, for the winter food supply. In districts fortunate enough to secure

good autumn blossom, it will be possible to extract all the honey in the hives over and above the bees' winter requirements, but in areas where very little autumn honey has been available, the store of honey in the hive may have to be supplemented by the apiarist. This can be done by supplying the bees with honey kept for that purpose, or with a syrup made by dissolving two parts by weight of sugar in one part of boiling water. The syrup should be kept at boiling point and stirred continuously until all the crystals have dissolved, and then placed in the hive while luke warm.

To ensure a good brood producing plenty of young bees to carry the colony through the winter, opportunity should be taken during the late April examination of the hives to replace any old or failing queens. Robber bees may be troublesome to weak colonies and in such instances the entrances to the hives should be reduced, thus enabling the bees to keep a better guard over their stores.—[J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

Pigs.

At the present time, ground barley or a mixture of three parts ground barley and one part of oats with skim milk or meat meal makes the cheapest ration for pigs.

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest

QUESTION.—Could you advise me *re* pasture improvement and the suitability of Tallarook subterranean clover in the Macarthur district (Western district), which has an average annual rainfall of almost 30 inches?

ANSWER.—On the lighter land in your district you should be able to establish good pastures by scarifying the native pasture and drilling in 4 lb. certified perennial rye-grass and 2 lb. subterranean clover per acre. The Tallarook strain of subterranean clover should grow well under your conditions.

The heavy flats, which cover a considerable area in the district, should respond well to top-dressing if they are already fairly well grassed, but if they have been cropped and are now poorly grassed it will probably be necessary to plough and re-sow them. Suitable pasture plants for growing on the heavy flats would be perennial rye-grass, phalaris, cocksfoot, wild white clover, strawberry clover, and subterranean clover. On the lighter rising country, perennial rye-grass, cocksfoot, and subterranean clover would be the most suitable species: *Phalaris tuberosa* should also do well on these heavy flats.

On both types of soil it will be necessary to give liberal applications of superphosphate (1 cwt. and 1 bag on the light ground and heavy flats respectively) if the pasture is to make good development.

QUESTION.—My potatoes are being attacked by potato tuber moth. Will pickling the seed in formalin kill the eggs or grubs?

ANSWER.—Pickling of seed potatoes in formalin is effective in controlling certain fungous diseases but it is of no use in checking grub damage. Best results are obtained by dipping in tuberol for half an hour. If done before infestation, spraying of tubers with this solution will be sufficient.

QUESTION.—What is the best pasture mixture to establish under irrigation for summer and autumn grazing in the Euroa district?

ANSWER.—A suitable pasture mixture for your conditions consists of perennial rye-grass, 10 lb., cocksfoot, 4 lb., red clover, 2 lb., wild white clover, 1 lb., and subterranean clover, 3 lb. Liberal manuring with superphosphate, and a watering once a fortnight during the summer months will be necessary for satisfactory growth. A pasture consisting of *phalaris tuberosa* and subterranean clover should also be suited to your purpose as the phalaris will tolerate both dryness and fairly wet conditions.

It should be mentioned that irrigated summer fodder crops such as maize, millett, or sorghums would supply the greatest bulk of green feed, providing you are prepared to cultivate and sow the area each year.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

THE hot, dry weather experienced in early March was responsible for the postponement of the sowing of green manure crops in many orchard districts. Harvesting operations also prevented many growers sowing these crops early enough to ensure good germination and growth before the soil becomes cold. The majority of Victorian orchard soils are so low in organic matter that if fertility is to be maintained, or improved, it is essential that cultural practices should include attention to a source of supply of humus.

Many growers in the older districts of the State recognized the importance of this material, and carted stable manure on to their orchard whenever this material was available. More recently fowl manure, at the rate of half a bag per tree, has become popular, and its application is having a marked effect on surface fertility. This is demonstrated by the increase in the plant growth around the trees. Where leguminous green manure crops will not grow satisfactorily, either because of acid soils or faulty drainage, better results may be obtained by sowing barley or oats and, if the sowing is late, an application of 2 cwt. per acre of sulphate of ammonia will assist in establishing the plants before the cold weather arrives. Blue lupins or peas—two legumes—can usually be grown satisfactorily after an application of ground limestone 1 ton per acre, and at sowing time 2 cwt. of superphosphate per acre.

For growers who must economize, top-dressing the soil with blood manure, or a complete manure of the 2.2.1 type, at the rate of 2 to 3 cwt. per acre to encourage the growth of natural herbage, will be found a good investment. If this practice is adopted the centre of the land should be opened up, by two cuts —one each way—with a single-furrow plough, to provide surface drainage. This procedure eliminates full autumn ploughing, and by encouraging natural weed growth for subsequent ploughing under it assists in increasing the fertility of the soil.

Orchards in which trees were lost as the result of the wet winter last year will require replacements. Thorough preparation of the soil before planting and the necessary attention to drainage problems will be operations which are worth while. Growers should bear in mind that where replacements are made among large established trees, the young trees require particular attention as regards feeding and more frequent watering. Too often one sees young trees struggling to grow under the same treatment as would normally be given to trees with a large root system.

When making replacements a small amount of blood manure up to 1 lb. per tree can safely be given to each tree. The best method of application is to place the manure around the tree and just turn it under after the tree is planted. If necessary, during the early summer the application can be repeated. The justification for this recommendation is that the space is unproductive, and the sooner it becomes productive the better for the returns per acre. Plant as early as possible, so that trees will be well settled down for early spring growth. Remember, root-development and activity precede top-growth in the spring.

Harvesting of early navel oranges will commence during the month. Generally, the summer has been mild, and if citrus fruits follow the example of the deciduous fruits their maturity is likely to be delayed from ten to fourteen days. In a normal season picking commences about the middle of the month, but this year maturity may be delayed until towards the end of April. This early-picked fruit will require colouring with ethylene gas. growers and packers should realize that the Ethylene gas treatment is not in itself a colouring process, but only hastens the development of the colour made by the fruit. If fruit is picked too early this colour has not developed sufficiently for it to appear well coloured after "gassing," and the fruit is a pale yellow colour instead of a bright orange. In past seasons, fruit picked too early has been held in the colouring chambers for periods as long as ten days in order to improve the colour. Such prolonged "gassing" is definitely detrimental to the fruit, which becomes impregnated with the gas and develops a disagreeable flavour.

Growers who experience this difficulty in colouring are urged to postpone harvesting operations for at least a fortnight. The citrus maturity standards provide that the acidity of the fruit must have decreased to a palatable amount and the juice content must be at least 30 per cent. by weight. Growers, who have not their own equipment, should submit

samples of their fruit to packing houses for maturity and juice content determinations before commencing to harvest.

"Woodiness" or "bullet" in passion fruit is fairly prevalent in most parts of the State. This condition is caused by a virus, and no cure is known. To reduce its incidence as much as possible, growers should select seed from healthy plants and discard all unhealthy seedlings when planting out. Seedlings should be raised, and subsequent plantings made as remote as possible from older plantations where the virus exists. The symptoms of this disease are a woody, distorted fruit, and a curling and mottling of the leaves. The winter crop is more frequently affected than the summer one, and old or weak vines appear more susceptible than young or strong vines.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

No doubt the hot weather during March exposed some of the weak spots in the garden, and special attention should now be given to rectify these. If the lawn grasses have been killed in patches, fresh seed should be obtained in readiness for planting after the first autumn rains. Loosen the top soil, sow the seed as evenly as possible, and cover with a light top dressing.

Some casualties probably occurred amongst the trees and shrubs, and, if so, the deciduous ones are best replaced in mid-winter, and the evergreen ones after the first autumn rains.

Although the soil may be very dry, it would be advisable to plant out such bulbous plants as freesia, ranunculus, anemone, tulip, narcissus, babiana, hyacinth, and lachenalia. This will enable them to get an early start, and become well established before the winter rains.

Plant out Primula malacoides, Iceland poppies, calendula, viola, pansy, winter-flowering stock, and cineraria. Primula malacoides is a dainty little flower that will bloom well during winter and spring. It may be grown in baskets, in window-boxes, as pot plants in the bush house, or in the open garden. The seeds are very small and should be sown about January in a prepared seed box; give the soil a good watering, sow the seeds on top; sprinkle a little fine sandy loam over them, and cover with a piece of paper to prevent the top soil from drying out. As soon as the seedlings appear, remove the paper, and water carefully, so as not to unduly disturb the young seedlings. If the plants are to be grown in pots, prick out into 2-in. pots, and at monthly intervals re-pot into 3½-in. and 5-in. pots. They will flower quite well in 5-in. pots.

If the plants are grown in baskets, window-boxes, or outside, prick them out and transplant as soon as they can be handled conveniently. They should be transplanted not later than the middle of this month. When grown in the garden, select a sheltered position and prepare it thoroughly. As they are winter-flowering plants, the area should be well drained. These plants respond to a good dressing of lime. Under suitable conditions, the plants will commence to flower in June, and continue until the warm weather of late spring. They are useful for table decoration, and last for a week or so in water.

During the past few years, the lavender shades have been improved by the introduction of various shades of pink. The two pink varieties usually grown are Princess Mary and True Rose; True Rose being the darker pink. Some people are susceptible to a skin rash if they come in contact with the leaves of some species of Primula, but there are very few who are affected by Primula malacoides. Primula obconica is one that is more likely to cause skin irritation.

Vegetables.

Peas and broad beans should be sown during April, but it is now too late to make further sowings of French beans. Sow seeds of onions, turnips, swedes, shallots, cabbage, and cauliflower.

April is the time to divide up and replant culinary herbs, and to plant strawberries. The autumn is also a good time to clean up the perennial vegetables. Asparagus fronds should be cut off and burned, and the bed given a liberal dressing of animal manure and forked over lightly to destroy weeds.

Continued on page 199.

The Fungicides Act

Registrations for 1940

By W. C. Robertson, Chemist

THE Fungicides Act is of twofold interest to the man on the land—firstly, because of its value in controlling the quality of any pest destroyer which may be purchased, and, secondly, because of the knowledge gleaned through its provisions in regard to the registrations of brands and the labelling of packages of insecticides, fungicides, weed and vermin destroyers.

An illustration of the first point—i.e., quality—is shown by the analyses of a number of samples of the various registered brands of nicotine sulphate which are given in Table I. These were collected from store and factory during the spring of last year.

One sample, supplied as nicotine sulphate, proved on analysis to be the alkaloid (nicotine) itself, which was of a particularly high standard of purity. Another sample was found to have a low content of nicotine, and is to be the subject of a prosecution. The average guarantee of the samples collected was 39.7 per cent. of nicotine, while the average percentage found in the samples totalled 41.4, which is 1.7 per cent. in excess of the guarantee. As the present retail price of nicotine sulphate varies from 55s. to 64s. 6d. per gallon, the excess nicotine is equivalent to at least 2s. 4d. per gallon. From the analytical figures it can be readily seen that the quality of the nicotine sulphate which is on the Victorian market is entirely satisfactory.

Vines require insecticidal and fungicidal treatment.

The list of registered brands for the current year, which appears as a supplement to this journal, contains the description and names of every pest destroyer which may be required by

TABLE I.—SAMPLES OF NICOTINE SULPHATE.

Brand.	Percentage of Nicotine.		Manufacturer or Importer.
	Guaranteed.	Found.	
Vallo ..	40·00	42·51	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
L.F.X. ..	38·00	42·07	Lawfords Fruit Exchange, Doncaster
Elephant ..	40·00	40·87	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Vallo ..	40·00	40·60	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Triumph ..	40·00	42·77	J. R. Mellor, 452 Queen-street, Melbourne
Pannifex ..	40·00	41·06	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Britnico ..	40·00	40·70	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Grazcos ..	40·00	42·13	The Graziers Co-op. Shearing Co. Ltd., 90–92 William-street, Melbourne
Avery's ..	40·00	40·71	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Sigma ..	40·00	41·68	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Railton's ..	40·00	40·73	Jas. Railton, 133 Elizabeth-street, Melbourne
Cooper's ..	40·00	40·84	Ramsay and Treganowan, 475 Latrobe-street, Melbourne
Hart's ..	40·00	41·69	Hart and Co. Pty. Ltd., 72 Whiteman-street, South Melbourne
Lion	38·00	40·65	Orchard Sprays Pty. Ltd., 549 Church-street, Melbourne

the farmer, orchardist, grazier, vigneron, market and home gardener. The list includes the guaranteed active ingredients contained in every brand of arsenate of lead (paste and powder) and calcium arsenate which is on the market.

Arsenic Compounds.

Arsenate of Lead.

The following standard has been proclaimed in Victoria for arsenate of lead, which is regarded as one of the most useful and effective insecticides:—

> "It shall contain not less than 31 per cent. of arsenic pentoxide (As_2O_5) combined with lead oxide and not more than 0.5 per cent. of water soluble arsenic compounds (As_2O_5), and shall contain not more than 0.2 per cent. acidity calculated as nitric acid, all calculated on the dry basis. The moisture content of the paste shall not exceed 50 per cent."

The regulations under the Act require the percentages of arsenic pentoxide (total and water soluble) on the dry basis to be stated on the label or branded on the package containing the insecticide. In the case of paste the water content must also appear on the label.

Where a spreader, wetter, or sticker is added to lead arsenate the package label must bear a statement to this effect. In this way the purchaser knows the guaranteed value of its killing efficiency (total arsenic pentoxide), the burn or scorch risk (percentage of water soluble arsenic compounds), the acid content (which influences the power of suspension), and, in the case of pastes, the dry weight obtained (water content). Although manufacturers endeavour to stabilize the percentage of water contained in the paste to comply with the standard, the moisture content is often rather irregular.

The standard is based on the absolutely dry arsenate so that, in the case of pastes, an uncontrolled water content would result in an

Table II.—Analysis of Lead Arsenate.

Brand.	Arsenic Pentoxide (As_2O_5).		Acidity as Nitric Acid.	Manufacturer or Importer.
	Total.	Water Soluble.		
	Per cent.	Per cent.	Per cent.	
Paste.				
Vallo	32·94	0·29	0·02	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Vallo	32·65	0·10	0·02	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Lion	32·65	0·10	0·02	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Lion	32·65	0·10	0·02	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Tip Top ..	32·65	0·14	0·03	Law Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Elephant ..	32·51	0·14	0·01	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Victor	33·08	0·10	0·02	F. R. Mellor, 440 Elizabeth-street, Melbourne
Carlton ..	32·51	0·05	0·04	F. R. Mellor, 440 Elizabeth-street, Melbourne
Blue Bell ..	32·37	0·10	0·01	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Berger's ..	32·37	0·10	0·02	Neptune Oil Co. Ltd., 532 Bourke-street, Melbourne
Berger's ..	31·23	0·10	0·03	Neptune Oil Co. Ltd., 532 Bourke-street, Melbourne
Aero	31·66	0·28	0·02	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Cooper's ..	32·22	0·14	0·08	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Powder.				
Vallo	32·41	0·17	0·01	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Vallo	32·82	0·16	0·04	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Cooper's Arsinette	31·58	0·17	0·04	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Berger's ..	32·86	0·21	0·05	Neptune Oil Co. Ltd., 532 Bourke-street, Melbourne
Blue Bell ..	32·01	0·28	0·01	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Victor	32·82	0·11	0·08	F. R. Mellor, 440 Elizabeth-street, Melbourne
Lion	32·95	0·11	0·01	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Plane	32·34	0·23	0·01	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Elephant ..	32·02	0·17	0·02	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Tip Top ..	32·96	0·17	0·06	Law Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Aero	31·77	0·10	0·01	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne

indirect increase in the price of the insecticide. For example, a hundredweight of arsenate of lead paste containing 52 lb. of the chemical and 60 lb. of water (53.56 per cent.) would be dearer buying than the same quantity of a paste containing 56 lb. each of lead arsenate and water (50 per cent.), although the analysis calculated on the dry basis may be exactly the same. Hence the reason for limiting the moisture content in the proclaimed standard.

The appearance of lead arsenate paste in its container is often deceptive because of the manner in which the heavy arsenate separates out, leaving a covering of water which makes the paste appear "watery." Thorough admixture by hand must occur before any attempt is made to guess the water content, which can only be proved in the laboratory by the simple expedient of thoroughly drying a weighed quantity of the well-mixed sample in a steam oven at 100 to 102°C. to a constant weight and calculating the percentage.

In Table II. appear the results of the analysis of brands of lead arsenate collected during the past season.

Calcium Arsenate.

Whereas lead arsenate is used most extensively in Victoria in the control of the codling moth and other leaf-eating insects, calcium arsenate, although it has a much higher content of arsenic pentoxide, is in small demand, its use being confined to the manufacture of dusting powders and baits. The main reasons for the poor demand are—(1) the inferior killing efficiency, (2) the marked increase in the water soluble arsenic which renders it dangerous for use as a spray, and (3) its poor suspension.

Other Arsenic Compounds.

Other arsenic compounds of minor importance, the brands for which appear in the annual list, include paris green, a compound of arsenic and copper which is rich in arsenic pentoxide and much favoured by vignerons for eradicating or controlling the caterpillar pest on vines. It is also recommended in the form of bran baits in intense culture for destroying cutworms.

One grave disadvantage in the use of this effective insecticide is its bright-green colour which masks its presence on green plants such as vegetables, thereby increasing the risk of poisoning to humans. While the high content of water soluble arsenic limits its use in horticulture, there are many who hold that paris green provides dual control, because the combination of arsenic and copper gives it both insecticidal and fungicidal properties.

Stocks of insecticides in a country store.

Arsenic Oxides.

There are two oxides of arsenic—viz., arsenious (As_2O_3) and arsenic (As_2O_5)—both of which are used extensively in agriculture. The arsenious oxide is commonly and incorrectly termed white or grey arsenic. It is extremely poisonous and is in common use for the preparation of baits for destroying vermin, such as foxes, dingoes, &c. Combined with sodium as the arsenite, it is used extensively both as an insecticide, fungicide, and weed destroyer. However, its most important function is probably that of active ingredient in sheep and cattle dips.

The careless misuse of the names of chemicals often leads to error which, in many instances, means much more than waste time. Recently a grazier in the back country, who was familiar with the use of *arsenic* (?) for scrub, weed, and timber eradication, attended an auction sale in an adjoining district and purchased a quantity of *arsenic* (?) at a most satisfactory price. Shortly afterwards he had occasion to commence scrub eradication, and, as usual, prepared to dissolve the purchased *arsenic* (?) in water. It would not dissolve! Inquiry showed that he had been in the habit of buying arsenic weed destroyer powder, which he knew as *arsenic,* and which is readily soluble in water. The *arsenic* (?) which he purchased at

auction was white arsenic, a substance insoluble in water and a totally different substance from the arsenical compound.

The standard proclaimed for sheep dip reads as follows:—"Arsenical sheep dip, when diluted with water in accordance with the instructions on the label for the purpose of dipping sheep, shall not contain less than .20 per cent. and not more than .25 per cent. of arsenic calculated as As_2O_3. It shall not contain free caustic soda." The lower limit is fixed as the minimum for toxicity to the pest, and the upper as a maximum for the purpose of eliminating or reducing the risk of poisoning the animal dipped.

The arsenic oxide (arsenic pentoxide) has come into prominence in recent times as a weedicide, particularly in connexion with the eradication and control of noxious plants such as blackberry, furze, boxthorn, &c.

Copper Compounds.

Ever since 1882, when Millardet accidentally discovered the value of Bordeaux mixture as a fungicide in the vineyards of France, the value of copper compounds as fungicides has progressed to such an extent that, for many years, copper in some form has been regarded as of paramount importance in the prevention of the attacks of fungi upon plants and animals.

Sulphate of Copper.

Approximately twenty brands of copper sulphate, more commonly called bluestone, are registered annually under the Fungicides Act. The active ingredient in every case is described as copper, and the percentage varies between 24 and 25. The fallacy that the imported bluestone has some mysterious quality which renders it different from and superior to the local article still persists in the minds of some users, in spite of the fact that the percentage of the active ingredient (copper) is the same in most brands, viz., 25 per cent. In the case of the brands registered as containing 24 and 24.5 per cent., these figures are probably given with safety first as the main objective by traders who do not manufacture the chemical, and therefore are not familiar with its purity. As the electrolytic copper produced in Australia compares more than favorably with that produced in other parts of the world—and the same applies to the local sulphuric acid, which, in combination with copper, produces copper sulphate—there is not the slightest reason why the locally-made commercial chemical should not be at least the equivalent in purity to any brand imported.

While copper sulphate is registered because of the demand for its use in manufacturing Bordeaux mixture, there are instances where the chemical is used in the uncombined state as a fungicide—for example, with lead arsenate in the control of black spot or other fungus diseases, as a dressing on the soil to prevent the germination of fungus spores, and in small amounts in citrus culture for the purpose of producing an elaborated sap in the tree which is held to render it more or less immune to attack by fungi. In these cases the quantity of bluestone used is strictly limited to small amounts or very light dressings. Copper sulphate is also in common use on the farm for the treatment of footrot in sheep. It will be noted that various trade names are attached to the brands which are registered.

The terms Niege, Snow, Instant, and Sugar associated with copper sulphate have made their advent with the general practice of preparing "Instant" Bordeaux mixture, and simply mean small crystals of bluestone specially prepared to accelerate its solubility in water to overcome the difficulty and loss of time associated with the old method of preparing a stock solution from the large crystals (lump or powdered).

Basic Copper Carbonate and Copper Oxy-Chloride.

Bluestone is largely used in the manufacture of basic copper carbonate and copper oxy-chloride, which are the two main bunticides used in the treatment of cereal seed grain. In times gone by copper sulphate, in water solution as a dip, was the main grain fungicide, but in recent years its use for this purpose has practically ceased. Copper oxy-chloride originated in Victoria as a bunticide under interesting circumstances, and is now being used as a fungicide and seed preservative in other parts of the world.

Basic copper carbonate, which is prepared from copper sulphate and washing soda, and for which the following standard has been proclaimed, differs from the oxy-chloride in its composition, but not so far as the percentage of copper, both total and water soluble, is concerned, so that the standard proclaimed applies to both substances. The proclaimed

standard for basic copper carbonate, &c., states:—

(*a*) Shall contain not less than 50 per cent. of copper in the form of basic carbonate, and/or basic sulphate or oxy-chloride.

(*b*) shall contain not more than 0.25 per cent. of copper in a form soluble in water.

(*c*) Not more than 2½ per cent. of the material shall be retained on a standard 200-mesh sieve when 10 grammes of the material are shaken by hand for five minutes with 150 cc. of water and washed through with a gentle stream of water.

Burgundy Mixture, Copper Soda, Etc.

Burgundy mixture, which is (or should be) a basic carbonate of copper, is registered to contain 12.5 per cent. of copper. Some brands, however, are simple mechanical mixtures of washing soda and copper sulphate. The mixture is favoured in some instances in place of Bordeaux, more particularly in cases where the latter may stain or blemish ripening fruit. It is made in a similar manner to Bordeaux mixture, except that sodium carbonate is used in place of lime, the common formula being 1 lb. of bluestone and 1½ lb. of washing soda to 50 gallons of water. Copper soda, Peach Bordeaux, or Soda Bordeaux, as it is variously called, is a similar mixture to Burgundy excepting that an equivalent of caustic soda is used in place of the washing soda. As in the case of Bordeaux, the fresh nascent mixture is to be preferred.

Concentrated Liquid Lime Sulphur.

The standard for concentrated liquid lime sulphur was altered in 1938, and now reads—

"Lime sulphur shall not contain any sludge and shall contain not less than 27 and not more than 29 per cent. of total soluble sulphur, not less than 19 or not more than 21 per cent. of polysulphide sulphur, and not more than 2.5 per cent. of thio-sulphate sulphur, all calculated as percentage by weight in volume." (Weight in volume is equal to pounds per 10 gallons.)

The reason for altering the original standard, which did not set a maximum percentage for either the total soluble sulphur or the polysulphide sulphur, but merely proclaimed the minimum percentages of 28 and 20 respectively, was due to the fact that these minimum percentages were greatly exceeded by the manufacturers, while the proclaimed standard or minimum figures were used on the label attached to the package containing the lime sulphur so that the purchaser was left entirely in the dark as to the correct dilution with water to give the desired spray strength. In the circumstances, the proclaimed standard was altered whereby both minimum and maximum percentages of the total soluble and poly-sulphide sulphur were fixed to avoid the risk of spray injury.

A preliminary survey of the lime sulphur on the market during the past season disclosed that the new standard was not being followed by some manufacturers as closely as desired, one sample in particular representing the previous season's stock.

Oil Sprays.

Oil for spraying purposes, whether crude, miscible (prepared), or emulsified, calls for little comment, because the trade controlling these lines has made a special study of the subject, and therefore has certain standard lines which, in doing their allotted task as ovicides and scalecides, are proving satisfactory to both user and manufacturer alike. White oil emulsions, which are innovations of comparatively recent date, have fulfilled expectations, and so effective have they proved that their use has extended to such an extent in Victoria that the original price charged has suffered a marked decline.

Coal Tar Distillate.

Coal tar distillate (neutral tar oil) is probably the only recently-prepared spray which has been used to any appreciable extent in Victoria. It is now recognized as a seasonable spray of importance, and is particularly valuable for the control of the peach aphis. It is also coming into use as an ovicide in preparations for the control and eradication of the blowfly pest in sheep farming.

Dusts.

The use of dusting compounds in market gardens, &c., is gradually increasing in Victoria. These mixtures rely upon the following well-known and common insecticides for their effectiveness, lead (or calcium)

arsenate, nicotine or nicotine sulphate, Bordeaux mixture and sulphur, and the percentages of active ingredients will vary with the compounds used in the mixture, which in turn will vary with the pest or pests to be destroyed, controlled, or deterred.

Weed Destroyers.

Mention has been made of the value of arsenic compounds to the man on the land, particularly to their use as weed destroyers. They have one great disadvantage, however, and that is they are not only extremely toxic to weed growths, but are deadly poisons to human beings and live-stock also.

There are non-poisonous chemical compounds which are more or less toxic to weeds and registered under the heading of weed destroyers. Sodium chlorate, which is a valuable weedicide, has the disadvantage of rendering everything with which it comes in contact, and which is capable of being burnt, highly inflammable, so that the careless operator may, in not taking the necessary precautions, meet with serious consequences. To counter this drawback, the chemist has produced mixtures of chlorates and chlorides of calcium and sodium in which the inflammable action of the chlorate is weakened and rendered much less dangerous by dilution with the chloride, which in itself possesses mild weedicidal power.

In concluding this review of the common and popular pest destroyers which are in use by the farming community of Victoria, attention must be drawn to the importance of the few chemical compounds in combating the ravages of pests on the farm. Lead arsenate, bluestone, lime, sulphur, nicotine sulphate, washing soda, and the arsenic oxides probably provide the average farmer to-day with 70 per cent. of his needs in the fight against insect pests and plant diseases. Add to this list of common chemicals the various oils and oil preparations, which are a comparatively recent discovery, as effective scalecides and ovicides, and the remedy chest is practically complete for the prevention or control of the usual or common pests with which he has to contend.

The list of registered Fungicides, Insecticides, &c., will be found in the Supplement to this issue.

Garden Notes

(*Continued from page* 193).

Rhubarb can be taken up and subdivided if necessary, and all portions of the crown showing signs of decay removed. Give the bed a thorough digging, and work in a liberal amount of farm-yard manure. Replant the selected crowns, spacing them about 3 feet apart, with the same distance between the rows. Do not plant the crowns more than 2 inches below the surface. After replanting do not pull any stalks during the first year, or at least do not pick too many of them.

If it is not necessary to take up the rhubarb plants, give the area a good deep digging; if the roots are cut through, it does not make any material difference to the plant. If new plants are required, the following varieties may be found useful:—

Topp's Winter, or Sydney Crimson (as it is called in New South Wales).

Keek's Wonderful. (Two large stalked varieties of good flavour.)

Mariner's Crimson and Victoria Grant. (Two good summer types.)

Wilson's Ruby—a good all-the-year-round type.

During the hot weather rhubarb should be watered liberally. It also responds well to heavy manuring.

Sulphur Dioxide

Its use in the Wine Industry

By D. G. Quinn, Viticulturist

MANY people contend that advertising would vastly increase the consumption of Australian wines, but for any success in this direction the contents of the bottle must be dependable, attractive, and true to its label and price. The presence on the market of the occasional faulty wine may be calculated to ruin any general advertising campaign.

Shiraz—an important sweet wine variety in the Rutherglen district.

The following paper is drawn up to indicate the necessity for the correct usage of sulphur dioxide during the manufacture of wine, for the opinion is held that intelligent use of sulphur dioxide is the best guarantee of the production of uniformly sound wines.

Various influences (climate, soil, variety, &c.) in the different regions of Europe give rise to wide differences in the composition of the ripe grape typical to each particular region. This fact in turn has given rise to definite regional types of wine. The world of commerce knows and expects these particular characteristics, and is apt to doubt the selling possibilities of wines from other parts of the world if they do not match the pattern of the European prototypes familiar to the public.

Each European type has a standard fixed acidity, which has been set naturally by the normal composition of the ripe fruit of the region in question, and centuries of experience have probably shown that the popularity of each particular type of wine suffers when the fixed acidity rises or falls from normal owing to seasonal variations. There appears to be a natural harmonic balance between the acidity and the body of each particular wine type, for we know delicate wine types can carry, with advantage, a relatively high acidity, but as the wine type increases in generosity or body, so the acidity should fall proportionately.

If we except unfortified Tokays and other artificially concentrated specialties, we will note that the normal products of warm dry climates are musts of higher density and low acidic energy, and wines made from such material have long been known to be very subject to bacterial spoilage. In ancient Rome the addition of gypsum to the fermentation was very general; also we know that the true Port varieties are exceptionally prone to bacterial trouble, and that the Spanish sherries are still protected by the ancient practice of "plastering".

This practice, by substituting acid potassium sulphate in place of cream of tartar which would otherwise be precipitated, raises the dry

residue by only 3 to 4 grammes per litre and the titratable acidity 0.025 per cent., but the acidic energy or pH is increased sufficiently to curb bacterial development without increasing, however, the titratable acidity or the effect on the palate appreciably.

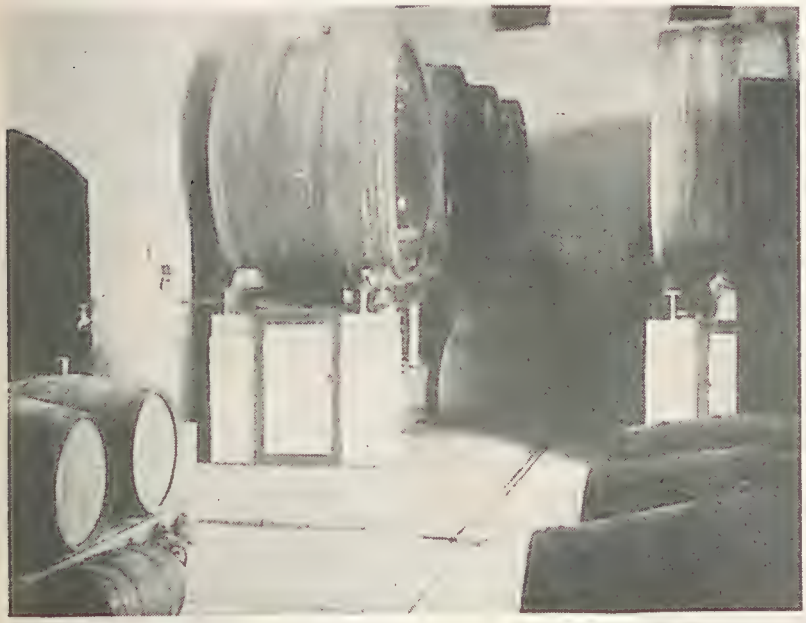
Years ago, on the recommendation of the French Academy of Medicine, the French law limited the sulphate of potash content of wine to 2 grammes per litre, as the French community drank large quantities of dry wine manufactured in warm climates. This regulation is also included in the Australian Pure Food laws and so the practice of "plastering" has had to be abandoned, as the regulation permits only about half the dosage necessary to attain a pH sufficiently low to inhibit bacterial development.

To obtain bacterial control by means of the addition of organic acids, the harmony or palatability of the wine is apt to suffer. Roughly, the final fixed acidity of heavy wines should range between 4 and 5, and delicate unfortified wines between 5 and 6 grammes per litre expressed as tartaric acid. For many years we have, when necessary, corrected the must acidity to produce a final acidity within the above limits, preferably with tartaric acid.

By increasing the acidity within these limits, bacterial action may be depressed or even suppressed in some cases. But as scientific research has not yet advanced sufficiently to place in the hands of the winemaker a simple test to show which wines are, and which are not, susceptible to disease, it appears sound cellar practice to protect all wines at all times from bacterial spoilage with the aid of the volatile germicide sulphur dioxide (SO_2).

Actually this is an age-old custom. Of late years, however, many people have gained the impression that they were doing enough if they utilized sulphur dioxide, during the fermentation period only, believing that the residual sulphur and subsequent fortification was sufficient to protect the wine during the maturing period.

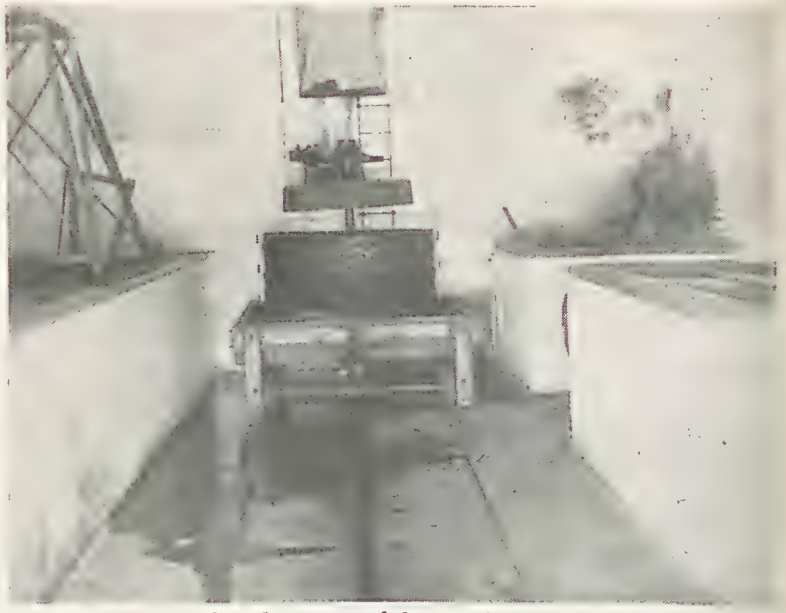
Also, some having heard of the beneficial action attributed to certain bacteria, were averse to the use of sulphur on this ground. The only useful bacterial change of which the writer is aware is that termed the "malo-lactic retrogression action". This action benefits Swiss and other cold country wines which often contain an excess of malic acid—a fault from which Australian wines are free. There is also a disinclination to use sulphur in the production of wines intended for the support of the Spanish sherry film yeast but this, like other yeasts, is not affected by sulphur dioxide at concentrations sufficiently strong to inhibit anaerobic bacterial growth. This latter point should be remembered when considering "fruity" dry wines and sauternes. On the other hand, we are all familiar with wines spoilt by excess sulphur, hence it appears that some operators have probably a groundless prejudice against the use of sulphur dioxide, while others do not know how to calculate the correct dose.



The interior of a small cellar at Rutherglen.

Cellarmen are familiar with the old practice of racking must or wine into hogsheads in which a wick carrying about half an ounce of sulphur has been previously burnt. If the liquid absorbs all the fumes generated, it would absorb approximately one hundred parts of sulphur dioxide per million. This is the dosage cellarmen used before the world knew of bacteria, and the balance of this article is intended to show that this is scientifically

the correct dosage, and how it can be most simply and accurately maintained.



Hand press and fermenting vats.

Use of Sulphur Dioxide during Fermentation.

In 1906, as the result of district experience and many experiments, members of the Montpellier school published information indicating the value of the use of sulphur dioxide during fermentation. Based on the fact that it takes ten times the dose of sulphurous acid necessary to check a wine bacterial fermentation, to check a wine yeast fermentation, they recommended the addition of 10 to 15 grammes of sulphurous acid per hectolitre of must, prior to fermentation. By this means bacterial action on the sugars with the consequent production of mannite, lactic, and acetic acids, could be prevented until the yeast fermentation had eliminated the sugar, or the wine was otherwise preserved.

To-day, the minimum dosage then recommended, still holds good, and the practice of sulphuring prior to vintage has become general in warm climates. This dose (viz., 10 to 15 grammes per hectolitre) is provided by the following quantities of sulphur in its various forms:—

- 1½–2¼ oz. of liquid sulphur dioxide per 100 gallons.
- 1½–2¼ pints of 5 per cent. aqueous solution of sulphur dioxide. (See Table I.)
- ¾–1½ oz. of sulphur vaporized by combustion.
- 3–4½ oz. of potassium metabisulphite.

(1 6/10 oz. of liquid SO_2 per 100 gallons or 1 lb. per 1,000 gallons equals one hundred parts per million.)

Prior to fermentation, if faulty fruit or bad weather has to be faced, the minimum dose can be appreciably exceeded, as very little sulphurous acid remains in the finished wine. In various tests, I have noticed losses ranging from 70 to 97 per cent. occur during fermentation.

Nowadays, liquid sulphur dioxide is the usual material used in wineries, and certain practical points have to be observed when dosing a must. First it should be added before fermentation starts, otherwise the rising bubbles will exhaust this volatile substance as quickly as it is added. Secondly, unless thorough mixing is achieved, parts of the tank may receive an insufficient dosage. If fermentation is in progress, or if additions are thought desirable during fermentation, the use of the 5 per cent. aqueous solution is possibly preferable to the sulphotometer. Finally, a freshly sulphited must should not be allowed to contact metal.

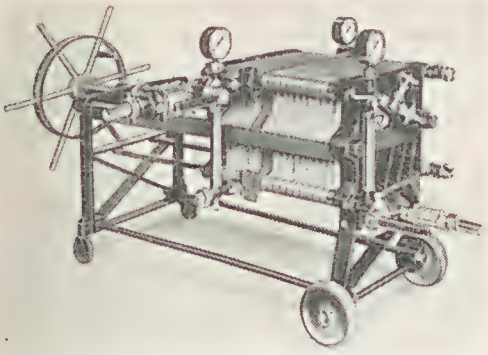
A complimentary operation to sulphuring is the pumping over of the must after the start of fermentation to avoid the reducing action of yeast and the production of the so called "sulphur stink", which often takes twelve months to eliminate by other means.

Use of Sulphur Dioxide in the After-Life of Wine.

Since ancient times, sulphur dioxide has also been utilized casually and empirically during the maturation of wine, but nowadays we prefer to perform such operations in an exact and scientific manner. In a paper submitted to the French General Assembly of Agriculture in 1937 on the "maladies of wine", a leading authority concluded as follows:—"In spite of all care and precautions at vintage harmful ferments are frequently found in wines, and the vigneron is thus interested in increasing the resistance of the wine to bacteria."

"A moderate sulphuring at the moment of racking, and the addition of citric acid and tannin, are the means of increasing the resistance of the wine to bacterial action. The use of centrifuges and refrigeration is helpful in eliminating bacteria, and the efficiency of the old practices, fining, filtration, and pasteurization to 70° Centigrade cannot be denied."

Unfortunately, the recommendation of "a moderate sulphuring at the time of racking" is rather an indefinite statement, and we have to thank American investigators for putting the matter more explicitly.



A cold sterilizing filter.

In March 1938, Professor W. B. Cruess of the University of California published an article entitled "Anaerobic and Facultative Anaerobic Organisms" and referred particularly to the lactic acid group of bacteria inhabiting sweet wines, which the University had been studying since 1913. After referring to the necessity for pasteurizing to 85°C. for one minute, the difficulty of sterilizing cellar apparatus, and the ineffectiveness of varying doses of alcohol and tannin, he states "that fortunately the organisms are fairly sensitive to sulphur dioxide, and in wineries where bacterial spoilage has occurred or is suspected, the sulphur dioxide content of wine should be maintained constantly at or above 100 parts per million, making additions at intervals of three to six months to combat loss by volatilization and oxidation".

With regard to the interpretation of a debatable technical point which may puzzle and confuse any one reading this article, the Agricultural Research Chemist (Mr. W. R. Jewell), has supplied the following advice:—"I am definitely of the opinion that all references to SO_2 content refer to total SO_2 and not to free SO_2."

The Victorian Pure Foods Regulations (also common to the other States) permit wine to contain—

45 parts per million free SO_2 and
450 parts per million total free and combined SO_2.

In a wine, the bulk of the SO_2 added remains in a free state as sulphurous acid for a few hours only. It changes to what is chemically known as the "combined form" (presumably with the sugars and aldehydes), and can be quickly removed only by aeration methods too radical, unfortunately, even for distillery operators to consider practicable. However, SO_2 is steadily but slowly released from the combined form, and I have observed that the average loss from a large volume of sweet wine, stored in hogheads and racked and filtered once, amounted to 90 parts per million of SO_2 per year.

Where the practice of adding liquid SO_2 to wine is adopted, one should bear in mind that, if the wine is run into fully sulphured casks at racking time, the SO_2 content may rise to the extent of 50 to 100 parts per million. In fact this point indicates the connexion between the old cellar practice of racking into sulphured casks and the more recent and accurate method of adding measured doses directly to the wine.

TABLE I.—THE SPECIFIC GRAVITY OF SO_2 SOLUTION SHOWING VARIATIONS WITH CHANGE OF TEMPERATURE.

Percentage. SO_2.	15° C. 60° F.	20° C. 68° F.	25° C. 77° F.	30° C. 86° F.
%				
1·0 ..	1·0060	1·0050	1·0034	1·0020
2·0 ..	1·0112	1·0093	1·0075	1·0057
3·0 ..	1·0170	1·0139	1·0113	1·0092
4·0 ..	1·0223	1·0173	1·0144	1·0119
5·0 ..	1·0241	1·0197	1·0176	1·0132
6·0 ..	1·0282	1·0231	1·0193	1·0158
7·0 ..	1·0319	1·0262	1·0205	1·0182

A 5 per cent. solution SO_2 contains 1 oz. SO_2 per pint.
Minimum dose for sweet wine—100 parts SO_2 per million 2 gallons 5 per cent. solution SO_2 per 1,000 gallons.

Conclusions.

From the foregoing it will be noticed that the loss of SO_2 during the agitated fermentation period exceeds very greatly that which occurs during storage. This latter loss appears to lie in the neighbourhood of 100 parts per million per annum, which is equivalent to 1 lb. of SO_2 per 1,000 gallons.

Sweet wines can carry much more SO_2 than dry wines without injuring the flavour. Very sweet wines can carry 300, ordinary sweets 200,

dry reds 150, while 85 parts per million is undesirably noticeable in dry white wines.

Based upon the American work mentioned and the writer's experience, there is reason to suggest that all wines should be raised to 150 parts per million of total sulphur dioxide a few days after the main fermentation has ceased and corrected to that point at intervals of three to six months, according to the rate of loss of the storage vessel. A rapid and simple method for the estimation of SO_2 in wine of any colour is described at the conclusion of this article by the Agricultural Research Chemist.

The above remarks apply only to wine in storage. Knowing the rate of loss, provision should be made to allow the SO_2 content to fall to what is considered the minimum safety point prior to sale. Where germ-proof bottling facilities are not available this would probably be in the neighbourhood of 100 parts per million for sweet wines and probably half this amount for dry wines.

Volumetric Method for Determination of Total Sulphur Dioxide in Wines (either Red or White)

The following method for the estimation of SO_2 in wine of any colour has been prepared by the Agricultural Research Chemist, Mr. W. R. Jewell.

Solutions required.

Standard N/50 iodine solution:—
2.54 grammes iodine and 5 grammes of potassium iodide dissolved in water and made to 1,000 cc.

Starch solution:—
Freshly prepared by boiling ¼ teaspoonful of starch for three minutes with 100 ccs. of water.

Sodium hydroxide solution:—10 per cent.

Sulphuric acid:—
1 part concentrated sulphuric acid to 3 parts water.

Apparatus required.

1 burette 50 cc.
1 pipette 50 cc.
1 Erlenmeyer flask 300 cc.
1 pipette 10 cc.
1 white glazed spotting tile, 11½ cm. x 8½ cm. with 12 cavities.

Method.

Pipette 50 cc. of the wine into the flask containing 10 cc. of the sodium hydroxide solution, the tip of the pipette being kept under the surface of the liquid.

Mix by shaking and allow to stand exactly fifteen minutes, shaking occasionally.

Add 10 cc. of sulphuric acid and 3 cc. of starch solution.

Titrate immediately with the iodine solution, running in the iodine rapidly until near the end point, when the iodine is added a drop at a time. The wine darkens nearing the end point, but the actual end point itself is determined thus:—On the spotting plate, just prior to titrating, place a drop of the wine in one of the cavities. When nearing the end point, with the stirring rod place a drop of the wine in another cavity and compare its colour with that of the original wine. The bluish tinge produced by the action of the excess iodine on the starch is clearly seen under these conditions. When the first bluish tinge is observed, allow the spot to stand two minutes. If the tinge persists, the end point is reached. If it fades, add a further two drops of iodine and stand two minutes. The end point is taken as being when two drops of iodine solution produce a bluish tinge which persists after standing for two minutes. The spot plate method is an advantage even with white wines.

This first titration should be discarded because of the time involved when nearing the end point. Repeat the titration on another 50 ccs. of wine, running in the iodine until near the total amount used in the first titration, and then finish by the spot test method. The number of cc. of N/50 iodine $\times$ 12.8 = total SO_2 in parts per million. If the iodine solution is not exactly N/50, a correction must be made for its normality.

Supply of Solutions.

For the convenience of local vignerons, fresh supplies of the solutions above-mentioned will be obtained by the Viticultural Station, Rutherglen, and retailed at cost in 8 oz. bottles during May and October only, the set of three (3) bottles being sufficient for 25 estimations—*Price 5/- per set.* The iodine solution deteriorates. It should be stored in the dark and should not be kept longer than one week.

This station is also continuing to supply a 5 per cent. solution of SO_2 at 9d. per gallon, throughout the year, providing cylinders of the gas are procurable.

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Clover-Lay Farming

For Mixed Farming Areas of Moderate Rainfall

By J. A. Morrow, B.Agr.Sc., Manager, Ruthe-glen Experiment Farm, and R. H. Hayman, B.Agr.Sc., Science Field Officer

Making and pressing clover hay at Rutherglen (1939) from a field which grew heavy cereal crops (1938 and 1939) following clover-lay.

FARMERS throughout Victoria are becoming increasingly conscious of problems of soil fertility and costs of production. This recognition is due largely to the demand for greater efficiency caused by a period of low prices, and latterly, to meet war conditions. In many districts loss of fertility has not been wholly offset by the use of improved varieties or methods, and declining yields are becoming more evident, particularly on regularly cropped land. In the more pronounced cases the paddocks are regarded as "cropped out," the solution being a spell under pasture. In others, the loss has been more gradual, but has been masked by the introduction of higher yielding varieties and the application of methods of cultivation which make the greatest use of the existing fertility.

Even where cultivation has been carried out to best advantage and the crops adequately manured, this deterioration goes on, although the rate is much less than where these factors have not received sufficient attention. Adequate alternation of cropping and grazing is not always practicable on small farms, as methods are usually dictated by the immediate need for revenue rather than by considerations of fertility maintenance leading to a larger revenue over a longer period of years.

A field demonstration at the Rutherglen Experiment Farm.

The rapid establishment of mid-season (Mt. Barker) subterranean clover and its high productive capacity when adequately top-dressed have resulted in an increasing area of high quality pasture, the value of which is indicated by the greatly increased number of stock which can be carried. The introduction of subterranean clover, on some farms trebling the carrying capacity, has placed fat lamb production in this area on a sound footing and made possible a closer co-ordination of stock and cereal raising, to the ultimate benefit of both.

In regions of moderate rainfall where intensive stock raising is economicaly practicable, it is possible to increase production and to maintain fertility at a high level by the introduction of suitable rotation systems based on the combination of cropping and stock raising.

Trials at Rutherglen.

Rutherglen, with an average annual rainfall of slightly less than 23 inches is centred in an essentially mixed farming district, and it is characteristic of its soils and climate that a satisfactory season is almost invariably experienced for one or more of its products. This has produced a diversity of activities, and made possible methods which are not practicable in districts of lighter rainfall. An example of this is a growing tendency towards clover-lay farming, in which subterranean clover is introduced as part of the cereal crop rotation.

The value of subterranean clover is not limited to its improvement of stock carrying capacity. Its effect in raising the fertility of the soil is well known, and has been amply demonstrated by tests at the Rutherglen Experiment Farm, where a system of cropping has been evolved which, if properly controlled, will result in a marked improvement in production, a lowering of costs, and a building up of soil fertility giving at the same time a large measure of control of soil erosion and weed growth.

Experiments designed to investigate methods of clover-lay farming are in progress at the Rutherglen Experiment Farm, and although the results are yet incomplete, sufficient evidence has been obtained to indicate that the inclusion of subterranean clover in a rotation with cereal crops will make possible a system of farming in which the customary fallow may

TABLE I.—MANURIAL AND FERTILITY INVESTIGATIONS.—SIX TRIALS (WHEAT AND OATS).

Manurial Treatment per acre.	No Manure.	Super., ½ cwt.	Super., 1 cwt.	Super., 1½ cwt.	Super., ½ cwt. and Sulphate of Ammonia, ½ cwt.	Super., 1 cwt. and Sulphate of Ammonia, 1 cwt.	Super., 1 cwt. and Sulphate of Ammonia, ½ cwt.
	bus./ac.	bus./ac.	bus./ac.	bus./ac.	bus./ac.	bus./ac.	bus./ac.
Wheat.							
Wheat after clover	26·2	34·5	37·0	37·4	34·8	35·5	36·9
Wheat on fallow	14·0	26·1	29·4	30·3	28·8	34·1	34·3
Wheat on stubble	9·5	12·6	14·2	13·0	13·4	13·6	14·5
Oats.							
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.
Oaten hay after clover ..	56·2	64·7	67·2	68·9	64·7	61·0	66·4
Oats on fallow	39·6	59·9	68·2	75·5	67·0	77·0	77·4
Oats on stubble	21·6	27·1	26·0	26·3	36·6	40·8	36·3

be omitted without loss of yield or reduction in soil fertility. The results given in Table I. show clearly the increased fertility given by clover-lay as compared with normal cropping methods.

In 1937 replicated wheat and oat manurial and fertility trials were sown at the same time in adjacent areas, which had the following cropping history:—

(*a*) Subterranean clover, 1928 to 1937, ploughed and sown June, 1937.

(*b*) Regularly cropped paddock, fallowed 1936, sown 1937.

(*c*) Regularly cropped paddock. Wheat 1936, sown on stubble 1937.

Germination on each site was good, and the yields obtained are set out in Table I.

The high degree of fertility built up by the clover is indicated by the yields obtained, and it is interesting to note that, at least as far as the wheat was concerned, the improvement could not be reproduced by the addition of nitrogeneous manures in economically reasonable quantities. A discussion of the use of manures for use on stubble land is not included in this article, but the advantages of mixtures of superphosphate and sulphate of ammonia are demonstrated in the above figures.

Taking the wheat plots manured with ½ cwt. of superphosphate per acre as an indication, the fallowing doubled the yields (from 12.6 to 26.1 bushels per acre), but the yield on clover-lay land (unfallowed) was nearly treble that obtained on the worked out stubble land alongside.

Soil analyses taken before sowing revealed that the nitrogen in parts per million of dry soil was as follows:—

Old stubble land	5.0
Clover lay	22.5
Fallow	13.2

The increase in the quantity of available nitrogen in the clover-lay land, and other benefits not yet fully understood, have enabled higher yields to be obtained even when the regularly cropped land has had the advantage of a period of fallow.

Not the least interesting feature of this test was the effect on the quality of the grain produced. The average protein content of the wheat on fallow was 7.78 per cent. (with a Pelshenke time of 95 minutes), while that grown on clover-lay had a protein content of 13.65 per cent. (Pelshenke time, 149 minutes).

These results, which have been confirmed generally by other tests at the Experiment Farm, show that better yields can be obtained from wheat when grown on clover-lay without fallow than can be obtained with fallow on regularly cropped land. In addition, the quality of the grain in the case of wheat has been improved to a marked degree. With oaten hay, similar results were obtained using light manure dressings, but the crop on fallow responded more than that on the lay ground to heavier applications.

The clover paddock, then one year stubble, was again cropped in 1938, the ground having been ploughed to 5 inches in late May and sown immediately afterwards. The very satisfactory yield of 29.6 bushels per acre was obtained,

Ewes and fat lambs grown on subterranean clover at Rutherglen.

this being as great as was obtained from any other farm paddock that season. These, and other tests, indicate that at least two successive crops could be taken from a clover-lay paddock without fallow and without loss of yield when compared with regularly cropped land.

Short term rotations with sub. clover.

Results of short term rotations with subterranean clover and its capacity for rapid establishment have suggested a method of land utilization in which, by a combination of stock and cereal raising, continuous production of crop or stock may be obtained at low costs and without reduction of soil fertility. The type of rotation which could be applied would vary considerably according to the history of the land, existing degree of subdivision, and proportion of grazing to cropping required. But as a general rule it may be taken that, on a well-established clover paddock, two good successive cereal crops could be taken off without fallowing.

Yields comparable with, if not superior to those obtained with fallow on regularly cropped land could be expected. After these crops, the land could be allowed to revert to clover for two or three years and the rotation then repeated. The length of time under clover-lay would necessarily vary with the seasons and soil conditions. Normally sufficient seed will remain after cropping to ensure re-establishment of the subterranean clover, but occasions may arise when re-seeding would be desirable. If the rotation is to be commenced on previously cropped land, it is desirable that the clover be sown with the last crop and allowed to establish itself thoroughly before cropping is resumed. If desired, perennial or annual (Wimmera) rye-grass could be sown with the clover. Once established, the rotation outlined above could be commenced, the duration of the clover-lay being the maximum that the subdivision permits.

Many farmers with well established clover pastures are averse to ploughing up such paddocks for cropping, with the result that full use of the clover as a fertility raising agent cannot be obtained and the cropped areas are in continuous use. When it is realized that it is possible for some of the customary fallow to be omitted without reduction of cereal yields, and the area under pasture to be correspondingly increased, such objections can scarcely be justified.

Since fallowing and cultivation represent a large proportion of the cost of wheat production, the adoption of a form of non-fallow clover-lay farming would help to place wheat growing on a more profitable basis in districts

A 3-ton per acre crop of oats growing on clover-lay land.

A poor, thin crop growing on "worked out" soil in experimental plots at Rutherglen.

where it could be applied, particularly when the fertility of the soil is being maintained over the whole farm by the highly productive subterranean clover.

Adequately manured and effectively grazed subterranean clover seldom allows any increase in undesirable plants and frequently eradicates such pests as saffron thistle and wild oats. The control of those pests by other means has been expensive, and, on the whole, ineffective. Cereal diseases such as flag smut, root rot, &c., would also be checked by wheat growing on a clover-lay system.

In wet seasons much of the surface soil of sloping cultivated paddocks under fallow is subject to erosion. By the elimination of the fallow period, and the introduction of clover into the cropping rotation a great measure of protection would be given, and a considerable amount of loss from this cause prevented.

Cultivation Difficulties.

A possible objection to clover-lay farming is the necessity for carrying out the whole of the soil preparations in the autumn before seeding is commenced. This objection is not so serious as it appears to be for, owing to the increased friability of the soil and the freedom from weeds, a scarifier may be used to partially replace the plough, and in good conditions the crop may be combined in without previous treatment. Any reduction in yield would be compensated for by the speed of the operations and the possibility of a better recovery of the pasture as the seeds are left nearer the surface.

Experiments on methods of cultivation are in progress at the Experiment Farm and the results to date obtained on the one site in two successive years are set out in Table II.:—

TABLE II.—CULTIVATION METHODS.

Treatment.	Clover-lay 1937.	Stubble after clover-lay 1938.	Average.
	bus./ac.	bus.	bus.
Ploughed 5 inches (harrowed)	37·5	29·6	33·6
Ploughed 3 inches (harrowed)	37·2	28·1	32·7
Disced 4 inches (harrowed) ..	36·9	26·6	31·8
Scarified 3 inches (harrowed)..	37·5	24·6	31·1

These results cannot be regarded as definite, but indicate that at least for the first crop after clover no appreciable loss in yield would result from discarding the plough and using the wider implement, scarifying to 3 inches deep. For the second crop the position is not

so definite. It would appear that the use of the plough is likely to give better control of weeds, the following factors requiring consideration:—

(*a*) If the condition of the soil is good, at the most small reductions in yield are likely to result from scarifying instead of ploughing, and they would generally be offset by the extra speed of the scarifier. If soil conditions are such that the scarifier will not satisfactorily bury and kill such weeds as cape weed, the plough should be used.

(*b*) In areas where early sowing is necessary to ensure satisfactory crops, it is necessary to have the soil prepared as quickly as possible. In many cases late sowing will depress the yield to a much greater extent than that shown in Table II., due to the scarifier.

(*c*) The scarifier does not bury the clover seeds. This may be important in younger stands of subterranean clover and in cases where a poor seeding precedes the crop.

(*d*) In many seasons, the autumn rains come sufficiently early to leave plenty of time for soil preparation.

Summary.

Subterranean clover will maintain or restore soil fertility, and by virtue of its characteristically rapid establishment and high carrying capacity, it is admirably suited to form part of a cereal cropping system.

It is possible to grow two successive wheat or oat crops on a well established clover-lay without reduction of yield, compared with fallow, and to permit a rapid re-establishment of the clover. A clover paddock at the Rutherglen Experiment Farm cut nearly 20 tons per acre of greenstuff in 1939, after having been cropped in 1937 and 1938. This was exceptional, but indicates that sufficient seed will remain after two crops to thoroughly re-establish the sward.

These facts make possible a system of farming in which a fallow period is not necessary and a rotation of, say, two cereal crops on clover-lay followed by a further lay period will maintain yields and fertility. The length of the clover-lay period will depend on the recovery of the clover, the amount of subdivision and other factors, but the system should be applicable to at least part of the farm in districts favorable to its use.

Under such a system of farming the stock-carrying capacity of the holding could be greatly increased, and this has been demonstrated at the Rutherglen Experiment Farm.

Other results would be a reduction in costs of production, crop diseases, and weed growth.

The replacement of the fallow period by a sward of subterranean clover may reduce the amount of soil erosion.

For the system to be satisfactory it is essential that the clover will be well established before commencing the regular rotation suggested.

Under certain conditions a scarifier may be used instead of a plough for the preparation of the soil.

Only by a judicious combination of stock raising and cereal growing is it possible for farmers to make the utmost use of their land and increase production without loss of soil fertility. For the method of farming outlined in this article to be successful, it is essential that the clover be effectively manured and grazed, otherwise weed control and soil improvement will be unsatisfactory, and the returns from the clover-lay disappointing.

Though the experiments have been carried out at Rutherglen, and the system evolved to suit that district, similar results should be obtained in any area where subterranean clover will grow satisfactorily and where cropping is undertaken.

Species Recommended

By L. C. Bartels, B.Agr.Sc., Senior Agrostologist

THE term "Irrigated Pastures" may be applied to any types of grasses or grass mixtures which, in districts of inadequate or uncertain rainfall, are artificially watered to permit them to live, or to augment production. Generally the term is reserved for pastures of introduced species which have been sown or induced to spread from chance beginnings by suitable treatment.

There has been a very large extension in the area sown to mixed pastures of grass and clovers in the irrigation districts of Victoria during recent years, and from a meagre start, some fifteen years ago, they have now come to rank as the most important crop grown under irrigation in this State. Early tests with pastures under irrigation were conducted at the Wyuna State Farm in the Goulburn Valley, and at the State Research Farm, Werribee, from its inception in 1912.

The present development which extends beyond this State must be regarded as a radiation from the State Research Farm because from the tentative trials made there, officers learned of the adaptation of the standard grasses and clovers to irrigated conditions. They grew well on soils which were too heavy or too wet to favour lucerne, and although adversely affected by prolonged dryness, they could withstand excess water which would kill established lucerne.

Lucerne has shown itself as a wonderful crop under irrigation and it was a basic crop in the development of most irrigation areas, but under ordinary conditions on an irrigation farm its useful life was limited. On the other hand, the pastures on the Research Farm seemed to improve with age. They showed great productivity and a sustained high carrying capacity; they withstood heavy grazing which is inimical to lucerne; they provided a variety in feed for stock; and because they were composed of several elements of different growth habits they presented better continuity in growth through the seasons. They were flexible and fitted the varying conditions of soil and treatment presented on an irrigated farm.

As compared with lucerne culture the great reduction in labour costs represented by depasturing grasses and clovers was an important consideration in their favour. Therefore, as the earlier sown lucerne began to thin out from various causes, it was replaced by mixed pastures until, at the present time, pasture has superseded lucerne with resultant economy and stability.

Pastures luxuriate in moist conditions unsuitable for lucerne.

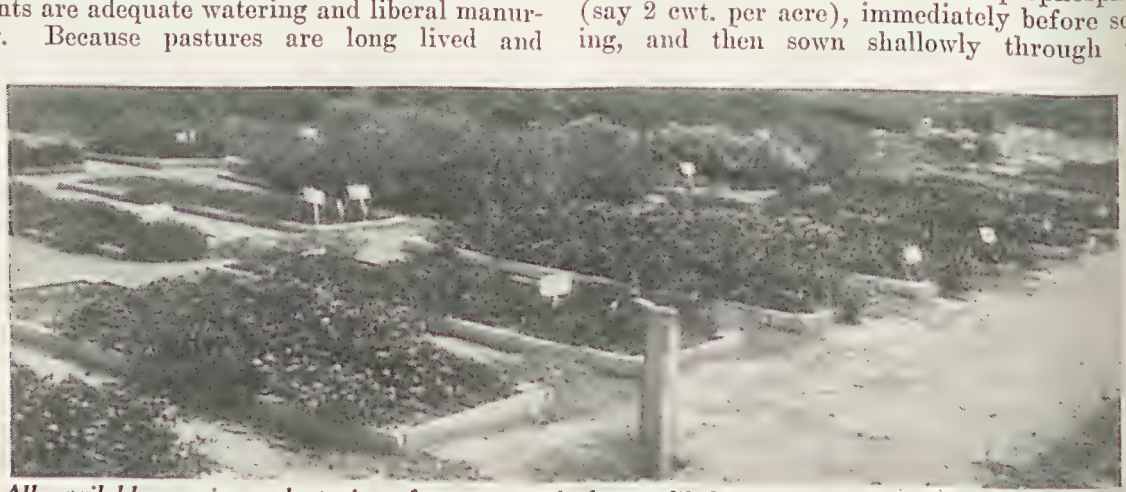
Pastures reflect the treatment they receive. The adoption of mixed pastures throughout the irrigation districts indicates an advance in cultural practices, but the value of mixed pastures is firmly established. They have revolutionized dairying practice in the irrigation areas; they have enabled farmers to extend irrigation to sections previously regarded as unsuitable and, most important, the pastures have become effective agents in reclaiming land which had deteriorated through exhaustive methods or through the development of salt.

For best results, mixed pastures should be given regular attention, but the basic requirements are adequate watering and liberal manuring. Because pastures are long lived and productive they deserve a good start, and the layout for irrigation should be such as to facilitate uniform and economical watering.

The border system of irrigation is recommended. This involves the division of the land into bays by small banks or levees running down the slope, and usually these bays may be appropriately 5 to 10 chains long and $\frac{1}{2}$ to $\frac{2}{3}$ of a chain wide. Although the bays are usually rectangular, the length and direction of the banks may be varied to meet different circumstances. It is unwise to have bays too long on porous ground. Frequent irrigation of pastures is necessary and long runs may lead to waste by deep percolation if water is applied frequently. Refinement in land grading usually means extended preparation.

A good seed bed is desirable, although it is conceded that after lucerne, for example, when the surface soil is in good heart, grasses and clovers will strike effectively with very little preparation. If pastures are sown in succession to lucerne, a satisfactory seed bed may be obtained without re-ploughing, but if even watering is not practicable, re-construction of the bays and re-grading may be necessary.

April–May is a good time to sow pastures, and when a suitable seeds mixture has been selected it may be mixed with superphosphate (say 2 cwt. per acre), immediately before sowing, and then sown shallowly through the



All available species and strains of grasses and clovers likely to be useful under irrigation are subjected to critical study at the State Research Farm, Werribee.

A luxuriant growth of perennial rye-grass and white clover at Dingee, Victoria.

manure run of the drill. If the tubes of the drill are taken out of the hoes and allowed to dangle the spread of the seed is comparable with broadcasting. A light harrow or a looped chain spread and trailing behind the drill will effect sufficient cover. Pasture seedlings like a firm seedbed; ordinarily, this is secured by the grading operations.

Spring sowing — August-September — will give good results too, although the young plants may need nursing by careful irrigation if dry weather supervenes.

Although it is important to sow high-grade seeds in the right proportions, it is pointed out that very different pastures will result from identical sowings according to the subsequent treatment given. Soil conditions, the amount and frequency of irrigation, the extent of manuring and grazing management all govern the relation of the different species.

The following mixture recommended by the Department of Agriculture has been the foundation of excellent permanent pastures in the different irrigation districts of the State under conditions where water is available to permit regular and frequent irrigation:—

	Per acre.
Certified Victorian perennial rye-grass	10 lb.
Victorian or certified New Zealand cocksfoot	5 lb.
Italian rye-grass	5 lb.
New Zealand perennial red clover	2 lb.
Victorian irrigation white clover or New Zealand white clover ..	1 lb.
Subterranean clover	1 lb.
Alsike clover	1 lb.
Strawberry clover	¼ lb.

Emphasis is placed on the value of high-quality strains of grass and clover—cheaper seed may be bought, but if high cost of the seed mixture is an objection, it is preferable to reduce the amount of seed sown than to compromise on the matter of quality of seed.

Although designed for permanent pasture, the above mixture includes elements such as Italian rye-grass which is an annual, and red clover and alsike clover which are short-lived perennials. Ordinarily, they disappear from the sward after the first few years, particularly

under hard grazing, but their inclusion is recommended because they contribute largely to the growth of feed in the first two or three years after establishment.

A premium is placed on certified seed of Victorian or New Zealand origin because the strains certified are natural selections, which have developed under local conditions or conditions resembling those in this State, and show greatest adaptation. For example, a measure of excellence in our best irrigated pastures is the proportion of the productive leafy and persistent strain of white clover known as irrigation white clover.

Victorian certified rye-grass, which forms the basis of the mixture, is leafy and peristent. Happily, there are good supplies of this seed available at present, but certified New Zealand perennial rye-grass makes a good second choice.

The cocksfoot of Gippsland old pastures is an excellent type; certified New Zealand cocksfoot also is good. Seed from these sources will give plants which are fine and leafy, compared with the stalky plants which generally result from seed of European origin.

Italian rye-grass is an annual or biennial. It has broader leaves and grows taller than perennial rye-grass. In fact, in a new pasture it may tend to dominate a mixture to the disadvantage of the more lowly plants such as white clover. Italian rye-grass favours moisture and high fertility, and it is an interesting fact that this species is appearing as a volunteer in old irrigated pastures which have been well cared for. This happens too, in the cases of prairie grass, and the advent of both of these elements may be welcomed because their presence in a sward indicates a better distribution of growth. Both are winter growers and they help to fill a depression in the production curve of irrigated pastures.

Perennial red clover or cow-grass makes strong early growth, and provides a bulk of feed before white clover is well established. If allowed to develop, it assumes an upright growth. Its leaves are large, they are hairy and usually have distinctive white markings. Red clover makes good hay but it is a valuable pasture plant too. Some farmers in the Maffra-Sale area are very chary about sowing it because they fear that it may cause bloat—unfortunately all the legumes may do so, and grazing of these species must be regulated to

A particularly vigorous pasture, dominantly white clover, in the Rochester district.

White clover and rye-grass pasture on the farm of Mr. J. W. Jackman, Dingee.

minimize this risk. In other districts no great trouble has resulted from including it in irrigated pasture mixture.

Alsike clover, if sown, usually is very conspicuous in the second year after sowing. It, too, has an upright growth, but the plant has smooth leaves without markings, and the shape of the flowers resembles that of white clover. It is a distinct species, although it was formerly thought to be a hybrid between red and white clover.

White clover is the queen of the clovers in irrigated pastures. It is a perennial with a creeping habit of growth. The stems root at the joints. The leaves are smooth and generally they bear a white horseshoe marking. White clover thickens up under good treatment. The maintenance of white clover in a vigorous, productive condition under irrigation calls for regular watering and liberal manuring. When these conditions are presented, the superior strains of white clover make volunteer growth in many districts. A measure of the great productivity of the Victorian irrigation white clover, which is a large-leaved type, is that five cuts of hay may be made from a good sward during the growing season.

Subterranean clover is now familiar to most farmers. It is an annual, but its peculiar habit of burying its seed secures its continuance. It has hairy leaves and a spreading habit of growth. Under irrigation it will make

Cocksfoot asserts itself when meadows containing this species are reserved for hay making.

Perennial red clover (cow grass) makes a useful contribution to the production of mixed pastures under irrigation during the first three or four years.

phenomenal growth, but because it is a winter-growing annual and dies down in summer it will wither up and leave bare space during the hot months. That condition often arises when it is sown in irrigated pasture mixtures. For that reason many farmers maintain that it should not be sown in mixed pastures under irrigation because "it takes control," but it may be stated emphatically that it does not take control under ordinary conditions, except where it is allowed to do so. Its inclusion in irrigated pasture mixtures is defended because it will produce feed, if through any circumstances the irrigated pastures do not get the attention they require, and it will do excellent pioneering work in building up fertility during early stages to make the ground receptive to the more exacting white clover and strawberry clover. Subterranean clover has a place of its own in irrigated agriculture under conditions where watering is restricted.

Strawberry clover has a habit of growth like white clover. Usually it is not so productive, but there are strains growing in northern Victoria which are bigger types than the commercial varieties. They are referred to as the "Swan Hill" and "Cohuna" strains. These constitute a big proportion of the herbage in the best pastures there.

Strawberry clover is most palatable to animals and it has many noteworthy features. It combines an ability to luxuriate in wet conditions with great resistance to dryness, and it is tolerant of salty conditions, so that it is an important agent in the reclamation of "salted lands."

There is an important strain of strawberry clover named "Palestine," and it is a giant strain by comparison with the standard type. It has a different rhythm of growth. By comparison with ordinary strawberry clover which is inconspicuous in winter, "Palestine" strawberry makes good winter growth. Under partially protected conditions this strain has made excellent growth and is worthy of attention.

Most other species of grass and clover will flourish under irrigation, e.g., timothy and meadow foxtail have persisted in the oldest pastures at the State Research Farm, Werribee, but those listed represent the best for general use.

Paspalum is a prominent feature of many irrigated pastures in northern Victoria. The tussock forming species is *Paspalum dilatatum*—the creeping one is *Paspalum distichum*—"water couch." *Paspalum dilatatum* is a warmth and moisture loving species. It is a perennial and a summer grower—it makes little or no growth in winter but in summer and autumn it grows profusely if sufficient water is available.

The conditions which favour *P. dilatatum*, also suit white clover and strawberry clover and because they often grow in association with the paspalum such mixtures may be very satisfactory, but their character is determined to a great extent by management. *Paspalum dilatatum* is a hardy and aggressive grass—it makes tall growth and if allowed to do so it suppresses the bottom pasture elements. The tall stems are woody and innutritious. Paspalum is resistant to dryness. It will survive with intermittent irrigation. It doesn't ask for liberal manuring and it is at its best when hard grazed, presenting fresh and nutritious growth. Undoubtedly it is a friend to the "poor" farmer.

It must be accepted by most farmers because of its intrusive habits, but good management will make it useful. Manuring to foster suitable associate plants, hard grazing to keep it down, and occasional mowing when grazing is ineffective, constitute that management.

Paspalum distichum is one of the few species available which will survive prolonged submergence in water and with *Poa aquatica,* another water-loving grass, it may be introduced into the natural or artificial swamps which occur on some irrigation farms and cannot be easily drained. In the search for associate clovers to grow under such conditions the Department has considered nodding clover (*Trifolium cernuum*), Michel's clover (*Trifolium michelianum*), and Fenugreek (*Trigonella ornithopodoides*). These three are annuals, but grow in very wet conditions. They respond to manure.

The lotus species—the birdsfoot trefoils—tolerate wetness too, but generally they are not much favoured on irrigation farms.

Phalaris tuberosa has a special place. It is useful where partial irrigation only is practicable, and where it is desired that species will grow under conditions where rainfall can be supplemented only by spring and autumn applications of water.

Under such conditions simple mixtures of the annuals, Wimmera rye-grass and subterranean clover are often used. They are easily established, although it is recommended that the ground be properly laid out before sowing. In sowing these elements a cover crop is permissible and a seeding of 5 lb. of Wimmera rye-grass or less with 2 lb. of subterranean clover and a bushel of oats per acre is a suitable rate.

Midseasonal or late strains of the clover should be sown and the late maturing "Tallarook" subterranean clover grows splendidly under irrigation because this treatment permits it to attain its full development.

Wimmera rye-grass and subterranean clover die down in summer. They may leave an abundance of nutritious dry feed, but farmers seek a green bite for stock in summer, and the elements which provide this, even under irrigation, are lucerne, perennial rye-grass of the better strains, and *Phalaris tuberosa.*

Usually lucerne is best sown by itself, but it is often included in mixtures. Perennial rye-grass is often substituted for Wimmera rye-grass because the hardier strains of this grass have developed under comparatively dry conditions and in the natural habitat in Victoria it withstands prolonged dry conditions in summer, so that in the irrigated areas autumn and spring irrigations only have sufficed to sustain it. *Phalaris tuberosa* is noted for its ability to withstand dryness, and it is a suitable species for inclusion in mixtures which may have to pass through periods of dryness

Pastures are long lived and have a sustained high carrying capacity at Merrigum.

between irrigations or to endure neglect enforced by attention to other duties, such as wheat harvesting, or by infrequent delivery of irrigation water. Accordingly, an admixture of 2 lb. of *Phalaris tuberosa* and 2 lb. of lucerne seed may be made with advantage.

As an advance on the simple mixture of Wimmera rye-grass and subterranean clover, a mixture such as the following may be considered, but it should be remembered that the maintenance of such a mixture will entail extra irrigation as compared with the Wimmera rye-grass and subterranean clover pasture.

	Per acre.
Wimmera rye-grass	5 lb.
Subterranean clover	2 lb.
Lucerne	2 lb.
Victorian perennial rye-grass (Clunes strain)	5 lb.
Phalaris tuberosa	2 lb.

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest

QUESTION.—Is salt harmful to lambing ewes? I am giving my sheep salt in unlimited quantities. As there seems to be some doubt (locally) about the advisability of this practice, I would be glad if you would advise me whether I am doing the right thing.

ANSWER.—It is not advisable to feed unlimited supplies of salt to sheep. Lambing ewes do best when they receive from one quarter to one half an ounce of salt per day. Some of this salt will be supplied in the food and drinking water so that it will not be necessary to feed the full amount as supplement.

Although the effects of feeding unlimited supplies of salt to lambing ewes is not fully known, salt poisoning has occurred amongst sheep at the State Research Farm, Werribee. The sheep showed a dejected appearance and were scouring badly. Their growth was also interfered with, but recovery was rapid after the salt was reduced. Only a portion of the flock was effected. Evidently it was those sheep which had a particular liking for salt.

The feeding of unlimited quantities of salt to milking cows has seriously reduced the quantity and quality of the milk produced, and similar results could be expected with ewes suckling lambs.

The amount of salt to feed will depend upon the purity of the water on your property. If the water supply is free from salt you could feed up to ¼ oz. of salt per ewe per day.

QUESTION.—Could you give me some information *re* zinc treatment for seed wheat, the price, and method of using?

ANSWER.—In parts of the Wimmera, particularly on black land in the western Wimmera, zinc has been shown to have a very beneficial effect on the growth of the wheat plant—resulting in increased yields of grain. The treatment consists of sowing a small quantity of zinc sulphate thoroughly mixed with the superphosphate when the crop is being sown. The optimum quantity to apply is not yet definitely determined, but if you wish to try the mineral I would suggest a dressing of 8 lb. to 10 lb. per acre in addition to the quantity of superphosphate commonly used in your district.

The zinc sulphate may be purchased separately—approximate price is 18s. 6d. per cwt. (Melbourne) in small lots—and mixed with the superphosphate any time prior to sowing, provided that the materials are dry and kept dry, or it may be purchased already mixed with the superphosphate.

The results of tests with zinc sulphate in the eastern Wimmera are as yet inconclusive, while elsewhere in the State, other than the Wimmera, there is no evidence to indicate that zinc will be of value to the wheat crop. With this in view, I would suggest that you make a trial with the mineral before using it too extensively.

Some farmers report that the mixture of zinc and superphosphate sticks to the stars of the combine, and the stars require scraping every day or so. This trouble is aggravated by moist weather, but is not a serious difficulty.

Sand Drift and Control Measures

By H. L. Hore, B.Agr.Sc., Inspector of Agriculture

THE purpose of this article is to indicate the nature of sand drift, to outline various experiments in connexion with the problem, and to describe control methods which may be used to overcome or minimize the damage caused by sand drift. Sand drift occurs in all States of the Commonwealth, but these remarks are confined mostly to the position as it is found in Victoria. There is, however, a close similarity in the problem here and in South Australia.

In Victoria, sand drift occurs to a serious extent in the Mallee, and in bad years the Wimmera districts may also suffer, but to a much lesser degree. There are also numerous localities along the coast, where sand dunes show a considerable lack of stability. Disregarding the coastal dunes, practically the whole of the sand drift areas of this State are located in regions of low rainfall, and drift is more acute in those localities where low rainfall is combined with high winds and high evaporation rates. If these conditions are severe enough most soils with a loose, unprotected surface will drift.

Topography of the Mallee.

Very briefly, the main topographical features of the Victorian Mallee areas consist of a series of ridges, troughs, and basins. The main ridges, of which there are several, run roughly in a north-south direction, and the highest point is at Walpeup—350 feet above sea-level, on the ridge which bears that name. Running nearly at right angles to the main ridges, i.e., approximately east and west, are innumerable small ridges which vary in height from a few feet to 50 feet above the general level of the country. It is these smaller ridges, which are such a common feature of Mallee areas, that are usually referred to as sand-hills.

Soils of the Mallee.

The surface soils of the Victorian Mallee can be classified very broadly as sandy loams, which would occupy over 50 per cent. of the area, sands, and a small proportion of clay loams and clay soils. In some places, limestone, as sheets, boulders, or rubble appears on the surface.

The sandy loams and sands, owing to the fact that they possess but little structure and cohesive quality show a greater tendency to drift when cleared than do the clayey soils.

Clearing and Cultivation.

In its natural state the Mallee carried, over its greater part, a wide range of vegetation which was well suited for the climate of the area. The vegetation comprised various

A typical sand hill in the Mallee.

species of trees, shrubs, and grasses. Of the trees, the predominant type was a eucalyptus species commonly referred to as Mallee. There was also a fair proportion of belar and pine frequently growing in association, and some plain country.

During the course of settlement, clearing, largely by means of the Mallee roller, proceeded with little regard to the topography or the nature of the soil; and the natural vegetation was removed over extensive areas in order that crops could be sown.

With the vegetation removed from soils that will readily blow, location in a region of 10 to 16 inches annual rainfall most of which falls in the winter, and the adoption of farming methods which involve cultivation of the land, the stage is set for wind erosion and sand drift which takes the form of dust storms, with soil and sand drifting along the surface until it meets an obstruction.

It was soon realized that the production of wheat under the low rainfall conditions which exist is very uncertain unless fallowing and cultivation are practised. Fallowing greatly accentuates the amount of sand drift in the Mallee and is the main cause of drift in the Wimmera.

Investigations and Control Methods.

The methods of control of sand drift used in other parts of the world are of considerable assistance in the development of control methods in this country, but owing to differences in soil types, climate, topography, farming practices, and the machinery available, &c., few of them can be used here without some modification. In Victoria, the main centre for experiment and research in connexion with sand drift is at the Mallee Research Station, Walpeup, in the centre of the Mallee. Preliminary investigations were commenced there in 1935, and in 1939, following a recommendation of the committee appointed to investigate soil erosion in Victoria, an additional officer was appointed at Walpeup. The work was then intensified and both technical and practical aspects of the problem are receiving attention.

The fundamental causes of soil movement by wind have not yet received much scientific study either in this country or overseas. Among the difficulties encountered in such work, are an absence of a guide for procedure and experimental technique, and a lack of suitable equipment.

Wind velocity is of great importance in connexion with sand drift. The power of the wind to lift and transport soil particles and other material is directly proportional to the square of its velocity. The reduction of wind velocity near the surface of the soil is the basic principle of a number of control methods, and endeavours are being made to devise some type of instrument or gauge to measure the reduction in wind velocity on or near ground level, due to the effect of surface trash, clods, and ridges, &c., on cultivated areas.

In addition to daily meteorological observations, records are made at Walpeup of the wind velocities, temperatures, and humidity leading up to and during dust storms. Coupled with these recordings are moisture determinations of the surface-soil and estimations of the amount of soil moved during the observed conditions. Efforts are being made to devise a means of recording and collecting the amount of dust in the atmosphere at various heights above the ground, so that the different fractions can be subjected to mechanical and chemical analysis.

It is known that the wind lifts the lighter, more fertile particles of the soil and transports them for long distances, while the coarser, less fertile particles are rolled along the ground. Experiments in America showed that the dust carried over a distance of 500 miles contained ten times more organic matter, nine times as much nitrogen, and nineteen times as much phosphoric acid as the residual heavier particles blown along the surface at the locality of the storm's source. The transported or dust material was of a much finer texture and consisted almost entirely of silt and sand with particle diameter less than 0.05 mm. The residuary material was more than 90 per cent. sand.

The rate of erosion and the amount of sand drift is influenced by the topography of the area. Sand hills appear to drift to a greater extent than do the flats.

Actual measurements of the rate at which the soil is being removed by wind in the Mallee are not available. In an endeavour to obtain definite information on this subject survey measurements are being taken of the changes taking place annually, and, over a period of years, of the soil levels on a number of areas of typical Mallee land. The areas chosen include both flats and hills, and the measurements are taken at points on a half-chain grid. In addition to giving the loss, if any, of soil over the whole of the area, an indication of the movement of soil from one part of the field to another is obtained. The areas under discussion are worked on a three-course rotation.

Soil Studies.

The technical investigations include an examination of the different soil types with regard to mechanical analyses and soil particle size, to determine the relationship between these factors and the degree of erodibility of the soil.

Drifting sand accumulates against fences and other obstructions.

Despite all the wind erosion that has taken place since the Mallee was cleared the information available indicates that the A or uppermost soil horizon, or a part of it, still exists over the greater portion of the Mallee. In restricted areas, however, the B horizon has been exposed, due to the wind removing the top-soil. It is generally assumed in America that erosion by wind proceeds at an increasing rate, as the top-soil is removed and lower horizons are exposed. Whether this is the case in Victoria has as yet to be determined, but as far as Mallee soils are concerned it is extremely doubtful.

It has frequently been observed that newly-cleared land on the Mallee Research Station drifts just as readily as nearby land which has been under cultivation for many years. Further, observations at spots throughout the Mallee where the B horizon is exposed indicate that the soil at such spots does not drift to the same extent as adjacent A-horizon soil. A close study of the soil profile may prove to be one of the most important methods of determining the amount of drift that has already taken place in this State, and also provide an indication of the damage which is likely in the future, unless control methods are adopted.

Fertility of the Different Soil Horizons.

If the surface soil is removed it is important to have some knowledge of the comparative fertility of the various soil horizons, that is, of the lower layers of soil. Again, American work on this subject indicates that the lower soil horizons exposed by erosion are much less fertile than the original top-soil.

On fallowed areas in the Mallee the surface mulch is frequently blown away exposing the hard, underlying soil. The crop grown on such areas reflects the eroded condition of the fallow by the presence of thin sparsely populated patches.

A comparison of the yields of crop grown on wind-eroded patches and adjacent normal areas is being determined by sampling methods. Another method being used to determine the fertility of the different layers is to artificially remove the soil on plots to depths of 3 inches and 6 inches prior to fallowing. Care is exercised to obtain comparable tilth in the areas prior to seeding. Plots are sown on the land so treated and harvest yields obtained provide an indication of fertility.

The addition of chemical substances to the soil may influence its erodibility by affecting tilth and aggregation of particles. Materials

Normal fallow showing large patches blown bare of mulch.

Left.—Even crop growing on fallow prepared by scarifying in July and ploughing later (Oct.) to leave rough surface and retain mulch. Right.—Showing patchy crop grown on normal fallow which drifted badly.

being tested in this regard include lime, gypsum, and the application of organic matter in the form of stable manure.

It must be accepted that sand drift will always be a feature of farming in dry Mallee areas, and that no simple method will be devised to completely prevent it. There are, however, several ways in which sand drift can be minimized. On certain areas of light land the abandonment of cultivation is no doubt desirable. Although fallowing is responsible for most of the drift which occurs in the Mallee, it is essential that this practice, in some form or other, be retained if successful wheat crops are to be grown in these areas.

Sand drift may be minimized on cultivated areas by adopting the following methods:—

Cover Crops.—The use of cover crops on the fallow as a means of holding the soil over the summer months is of fairly recent origin in this country. The method consists of ploughing the soil in the normal manner in the winter, and as a working in the early spring, a crop—usually oats—is combined in. This crop is allowed to grow until well established, when it is grazed off, care being exercised to leave sufficient stalks and roots to hold the soil over the summer months. In tests at the Mallee Research Station this method of control has proved very effective in holding and catching sand, and has almost completely eliminated the trouble where the cover crop was successfully established and handled.

The yields of wheat grown on cover crop fallow are somewhat lower than those grown on normal fallow—the reduction at Walpeup being 1.3 bushels per acre as an average for the two years 1937-38. Normal fallow yields were 22.3 bushels as compared with 21.0 bushels per acre where a cover crop was grown. This reduction in yield is offset to some extent by the grazing for sheep provided by the cover crop.

Many different species of plants are being tested for their suitability as cover crops for Mallee land. A serious disadvantage in this form of control is that in drought years, the cover crop may not germinate or develop sufficiently well to be of any use.

Cultivation Treatments. — The cultivation treatment which the land receives influences the condition of the mulch. Frequent cultivation produces a very fine powdery surface which blows away readily, and together with dry workings, over cultivation should be avoided. On sandy soils it is very difficult to produce a cloddy mulch which will resist drifting. However, this can sometimes be achieved

Drift control investigations at the Mallee Research Station.—Grazed stubble of cover crop preventing soil from drifting on sandy rise.

by deeper ploughing or reversing the usual cultural operations and ploughing as a last working in the spring before which the area has been either heavily sheeped or lightly cultivated to prevent the growth and seeding of weeds. At all stages during the fallowing period, sheep should be used to control weed growth as far as possible so that cultivation may be reduced to a minimum.

A comprehensive experiment comprising fifteen cultivation treatments, such as depth and time of ploughing, control of weeds by grazing and/or cultivation, the use of different implements, stubble burning and so on is now in operation at Walpeup. The results of a few of these treatments on the yield of the crop are as follows:—

CULTIVATION TRIALS, MALLEE RESEARCH STATION.

Average Results, five years (1934-38).

Treament.	Yield bus/ac.
Deep fallow	22.5
Normal fallow	21.6
Late fallow	21.4
Sheeped fallow	18.9
Non fallow	15.5

Deep fallowing, i.e., to a depth of 5 inches, has given a slightly higher yield than normal or 2½-in. ploughing.

In the tests at Walpeup, late or September fallowing has not reduced the yield of the subsequent crop very much. This is attributed to the fact that in these tests weeds were rigidly suppressed by heavy grazing on the late fallow areas prior to ploughing. The land worked up somewhat rougher and drifted less. In most tests throughout the State, late fallowing is reflected in much lower yields than normal winter fallowing. Sheeped fallow—in which heavy grazing by sheep replaced cultivation between the original ploughing and seeding caused a diminution in yield of 2.7 bushels per acre below normally-worked fallow, and on non-fallowed areas the yields were much lower still.

Survey measurements are taken on the various cultivation test plots before and after the drift season. These, combined with an accurate recording of the extent of windblown patches, indicate the amount of drift occurring under each treatment. Tests are also conducted to determine the effect of the cultivation treatments on soil particle size, and the compaction or consolidation of the soil.

Where straw and trash are present to an appreciable extent, its maintenance on or near the surface has been found advantageous as a drift control measure, although it may eventually lead to an increase in crop disease. Whether the action of the straw is mechanical or chemical or both, is not certain, but from observation it would seem that it is of assistance in reducing wind velocity at the surface of the soil and, in addition, acts as an obstruction to moving particles. The use of the disc and overhead draft scarifiers permits of cultivation through greater quantities of straw and rubbish than is practicable with the ordinary mouldboard plough.

The development of special implements to assist in erosion control warrants more attention in this country. In America, implements have been devised and adapted for this particular purpose. The presence of stumps in most Mallee land prevents the use of knife bars and rod weeders which leave trash and cover as a protection on cultivated soil.

The ridges or surface corrugations left by cultivating machinery are of assistance in reducing drift on fallow. On light soils, the benefit derived from such ridges is of short duration in high winds and special ridging, furrows or listering may be resorted to. This method of control consists of making deep furrows and ridges across the fallow at right angles to the direction of the prevailing winds. Experiments are in progress to determine the most effective spacing and the frequency of the furrows necessary to give the best control. In practice, the furrows may fill up, and to be effective they must be cleaned out or new ones put in. It may be necessary to lister a whole paddock.

In 1937-38, a large-scale drift control demonstration was conducted on the Mallee Research Station to determine the effect of cultivation treatment on the amount of drift. An area of apprxoimately 100 acres of typical Mallee land was laid out in strips approximately 1 chain wide, and the treatments carried out were—(1) spring clover crop fallow; (2) ploughless fallow; (3) scarified early to control weeds, and ploughed as last operation before summer; and (4) specially-ridged fallow. Check strips of normal fallow were included, and the various treatments replicated.

The maintenance of straw on the surface of the fallow assists materially in reducing drift.

Deep furrows on the fallow are temporarily effective in preventing drift. When they become filled with sand however, new furrows are necessary.

A sand hill on which the wind has removed the surface soil for a depth of several feet.

The amount of drifting which took place on each strip was determined by detailed observation and measurement. Areas where the whole of the surface mulch was removed were recorded as bad, a thin mulch of up to 1 inch as moderate, and a mulch of 1 inch to 2 inches recorded as slight drifting.

The percentage area of each of these degrees of drifting was determined for each treatment. As some of the cultivation practices resulted in a greater percentage of bad drifting than others, the following arbitary co-efficients were adopted to reduce all types of drift to a common basis. Slight drift 1, moderate drift 2, bad drift 4.

This resulted in the following figures, which may be regarded as an indication of the relative amounts of drift for each treatment. Spring cover crop—0; ploughless fallow—11; scarified early and ploughed late—17; specially ridged—28; and normal fallow—40. Of course the higher figures indicate a greater amount of drifting.

One of the most effective methods of preventing soil drift in the United States of America is by means of strip farming. This involves the sowing of crops in strips across the paddock or farm, at right angles to the direction of prevailing winds. Alternated with the strips of growing crop are strips of cultivation which may vary in width from about 1 chain to 5 chains. The growing crop provides a protection to the cultivated land from the wind, and, in addition, the crop adjacent to cultivated areas catches and arrests any soil which may move, before it has travelled far. Where strip farming is practised, stock, if carried, are not pastured extensively in the paddocks. In Australia, the fact that stock are maintained almost exclusively in the fields is a serious bar to strip farming.

Rotation of Crops.—The rotation of crops has a bearing on the amount of sand drift occurring in an area. A short rotation of fallow-wheat involves larger areas under cultivation and hence more land in a condition to drift readily. Stock cannot be carried to the same extent, and more cultivation is thus necessary. While the land is carrying a crop or herbage of any description, or even a crop residue in the form of stubble, drift is not troublesome. There is no hard and fast rotational practice in the Mallee, although a three-course rotation of fallow-wheat-oats or fallow-wheat-pasture is probably most common. A very comprehensive rotation test was commenced at Walpeup in 1937, and twelve different crop rotations are being tested, but the results to date, although interesting, are not of sufficient duration to supply reliable information.

Control on Non-Cultivated Areas.

Experimental work in connexion with drift control on non-cultivated land has so far been mainly in the direction of finding a suitable plant as cover. It frequently happens that the tops of hills become so windswept that the surface soil is removed for a depth of several feet. To make the best use of such land it is necessary to remove the stumps and prepare the land for cover. The exposed surface of such hills usually is fairly impervious to moisture, and much of that which falls, runs off. Contour furrows will assist in preventing the run-off of water and the establishment of vegetation.

A nursery of sand binding plants.

It has been found that rye-corn is a very suitable plant to sow on windswept areas. It can be grazed lightly, but such grazing should be very restricted so that the plants develop plenty of straw, and seed for re-growth in subsequent years. With a good cover of straw, weeds, grasses, and shrubs tend to establish themselves, and if the area is sufficiently protected from stock and rabbits it may eventually be re-vegetated.

On loose sandhills, such plants as pyp grass, marram, or blue lupins have been successfully grown in the better rainfall Mallee areas, particularly in South Australia and Western Australia. So far, the experiments with sand-binding plants have not been very encouraging in the lower rainfall belts of this State. For coastal dunes, however, they are of particular importance. On very loose sandhills which encroach on roads, railways, &c., brushing or thatching of the surface by boughs may be resorted to, and the use of such materials as salt and sump oil on loose sandhills is under test.

Mallee Pastures.

The subjects of drift control and pastures are closely related in that land too light for cultivation, and that retired from cultivation for a few years only is best protected by vegetative covering. Suitable grasses and pasture plants would give the most effective utilization of such areas.

A pasture plant nursery was established at the Mallee Research Station in 1934. In this, seeds of drought-resistant species obtained from various overseas and local sources are tested for growth, persistence and suitability under Mallee conditions. These experiments have now developed to the stage where lucerne, early strains of clovers and medicks, Wimmera rye-grass, perennial veldt grass, evening primrose, and other plants are tested under field conditions. In addition to determining the most suitable species, the best means of establishment, manurial and grazing practices for optimum development are receiving attention.

Shelter Belts.

One cannot leave the subject of sand drift without some reference to shelter belts. Personal observation leads me to the conclusion that the use of shelter belts is somewhat restricted in preventing drift over extensive cultivated areas. To be effective, wide belts at frequent intervals would be necessary.

In a rectangular paddock of only 104 acres at Walpeup, protected on the north, south, and western sides by dense shelter belts, extensive drifting takes place if the land is bare fallowed. With narrow belts of timber the trees reduce the wind velocity sufficient to deposit banks of sand on the lea side, where it forms a hill. An experiment was inaugurated last year to determine by means of survey levels just how far a good shelter belt of known density and height will protect land on the lea side.

It cannot be too strongly emphasized that the growing or retention of existing trees and shrubs around buildings, reservoirs, &c., is of great protective value to the particular spot and improves living conditions within that area for both man and beast.

Boundary Control Methods.

Most of the control methods already outlined aim at preventing sand-drift at its source, i.e., where is originates. Of a different type are what may be termed boundary control methods, to prevent windblown sand encroaching on growing crops and essential services such as channels, roads, railways, fences, and buildings.

One of the commonest boundary control methods is to leave uncultivated strips of land or easements on the windward side of the property. Where of sufficient width and covered with vegetation of any kind, such easements may be quite effective. Grass or weeds will catch a large volume of sand.

If all the surface cover on the easement is removed, for instance by over-grazing, or burning as in the case of stubble, it becomes useless, for sand will blow for many chains over a smooth surface. Deep furrows on the easement will assist temporarily in trapping the sand, or crops may be sown for this purpose.

Boundary control methods are temporary expedients only. They offer no real solution of the problem of drift control and their efficacy depends on the quantity of sand with which they have to contend. The most logical place to attack sand-drift is on the actual areas where it originates.

Brush fences are sometimes erected where protection is essential, and the Railway Department have erected a number of simple windchutes which deflect the wind through a narrow opening near the ground thereby increasing its velocity sufficient to carry the drifting sand across the lines and deposit it on the other side.

A general view of the pasture plant nursery at the Mallee Research Station.

Lamb Marking

By A. R. Grayson, B.V.Sc.,
Veterinary Officer

SHEEP farming is becoming, each year, more definitely a business undertaking. Competition, not only between individual breeders and countries, but also against artificial substitutes, is increasing and the position has been reached where each breeder must consider conducting each and every operation connected with his business along the most practical and scientific lines so as to minimize loss and wastage.

Consequently, the question of lamb marking, and the precautions that must be taken to ensure the successful carrying out of that operation, must receive the serious consideration of each individual sheep breeder. It is quite obvious that much of the success of sheep farming depends on the percentage of lambs reared, and it is still more obvious that, when a high percentage drop of lambs is at all appreciably reduced as a result of marking, much of the year's profit has disappeared.

Lamb marking consists of three operations—ear marking or tagging, castration and tail-docking. These operations are usually performed in the order mentioned and at the one handling. In this article, however, it is proposed to deal only with castration and docking.

Age and Time for Marking.

Any strong lamb could be marked with safety after it is a few days old. In practice, however, lambs are marked, according to the drop, at any time when they are between one and four weeks of age. The time of the year at which the operation is performed is solely dependent on the time at which lambs are dropped, varying in different districts and States.

The operation should be carried out during a period of mild weather. Weather that is wet and cold, particularly if there is a bleak wind, should be avoided, as should also hot sultry weather when there would be a greater possibility of "fly strike" occurring. Even in mild weather, the operation should be performed only in the morning and early afternoon and not continued on until evening, otherwise there is a possibility that some lambs will not be "mothered" before night. These lambs which do not find their mothers in all probability will die.

Lamb marking in the open paddock away from permanent yards.

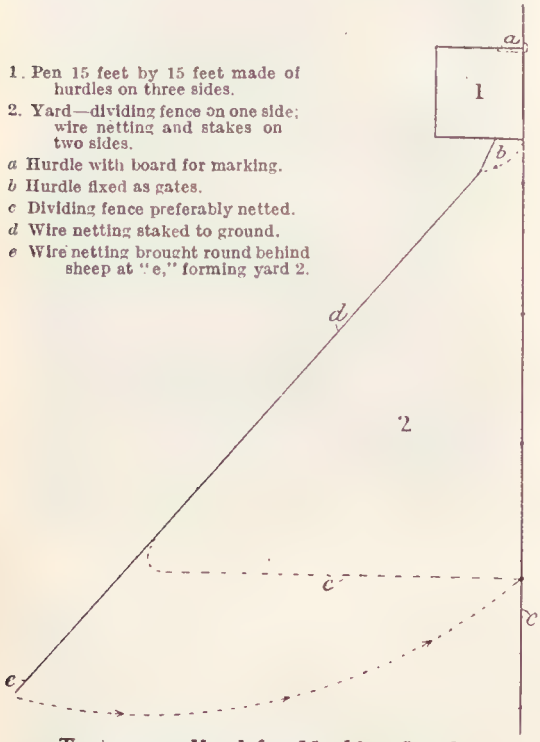
Site for Operation.

Temporary pens and yards erected out in the paddocks, where the ewes and lambs are running, form the ideal site. The lambs after the operation are then placed directly on to the fresh clean pasture and not on to the dry dusty ground, soiled by manure accumulations, which so often surround old permanent yards. This naturally minimizes the risk of wound contamination. Further, if the operations are carried out actually in the paddock in which the sheep are living, the lambs do not become hot and tired in being driven to the yards, and after the operation they find their mothers and settle down much quicker.

Such temporary yards and pens, for a small flock, can be constructed with little trouble simply by using hurdles, wire netting, and stout stakes. For large flocks, the construction of the yards may have to be more elaborate and difficulties may be created, but the advantages gained would more than outweigh the trouble

involved. The yards should be dismantled after the job is finished and a fresh piece of ground selected as a site the following year.

The accompanying sketch forms a plan suitable for temporary yards for a flock of 250 ewes and their lambs.


1. Pen 15 feet by 15 feet made of hurdles on three sides.
2. Yard—dividing fence on one side; wire netting and stakes on two sides.
a Hurdle with board for marking.
b Hurdle fixed as gates.
c Dividing fence preferably netted.
d Wire netting staked to ground.
e Wire netting brought round behind sheep at "e," forming yard 2.
a
1
b
d
2
c
e

Temporary Yard for Marking Lambs.
Will hold 250 ewes and their lambs—scale, 1 inch equals 35 feet.

The ewes and lambs are driven into Yard 2 and the netting fence closed behind them at *e*. The Yard 1 is used as a catching pen and the operator stands at *a*. At this point, a smooth clean piece of new board, such as a 6-in. flooring board, should be nailed to the rail or hurdle and used as an operating platform. This board should be kept clean during the course of the operations by scrubbing it with a solution of washing soda in hot water, and a new board should be used each season.

Where the erection of temporary yards is not practicable and permanent yards are used for lamb marking, every precaution must be taken to make them as clean as possible, and consequently as safe as possible. All manure and refuse must be gathered and carted away to a safe distance. The yards should be well watered to prevent dust arising. If possible, the site of the operation should be selected so that the lambs may be dropped, after marking, on to clean grass and not into a yard. The rails, &c., adjacent to this site should be thoroughly disinfected and a fresh surface prepared with an adze, &c.

The Operation.

Various methods, differing somewhat in the technique, are employed in the actual castration of lambs. It is not proposed here to enter into any discussion of the relative merits of any of them.

The object of the operation is to remove or destroy the testicles of the male lambs. Where removal is practised it must ever be borne in mind that the risk of infection, either during the operation or afterwards, is always present. The whole aim should be to lessen this risk, and it is to this end that the use of temporary yards on fresh pasture and the clean operating table have been advised. These are, however, in themselves, not sufficient. It is essential that all instruments must not only be sterile at the start of operations but also should be kept as far as possible in a sterile condition.

Sterilization of Instruments.

Knives should be wholly metal and preferably not hinged so that they can be effectively sterilized. The best and surest method of sterilizing all instruments is to boil them for ten to fifteen minutes in water, and all instruments other than knives should be so treated. Continual boiling affects the cutting edge of a knife, so after sharpening and cleaning it should be put into a dish containing methylated spirits. The knife, when not in actual use, should be kept in the spirits. There should also be at hand a shallow flat dish containing a solution of 1 teaspoonful of lysol to 1 pint of water in which all other instruments are kept when not in actual use. The clothes, not only of the operator, but also of the catchers should be as clean as practicable.

If by any mischance an instrument should be dropped or become otherwise soiled by dirt it should be re-boiled. The operator should have water, soap, antiseptic, and a nail brush always handy for washing his hands, and he should not attempt to assist in any other work. It is worth noting that when, as is so often the case, the lambs at marking time are also being inoculated against entero-toxaemia, this inoculation should never be performed by the

marking operator but by another man who can personally maintain sterility of the syringe, &c.

Some further points should be borne in mind while marking lambs. Lambs must be handled as gently as is possible. The catcher and/or holder should sit the lamb on the board, taking care not to unduly strain the lamb by pulling the legs too far apart. The cutting off of the end of the scrotum is preferable to slitting it, as by the former method better drainage is obtained, and blood clots will not be retained to act as media for the development of germs. After the operation the lambs should be dropped gently on to its feet on the grass.

The Bloodless Emasculator.

Coming into much greater favour and general use for marking lambs is the bloodless emasculator. The efficacy of this instrument depends on its being jointed in such a way that great pressure is exerted at its jaws by the application of a comparatively small force at its handles. The jaws are made so heavily and strongly that no pressure is lost by the springing of the jaws, which are also wide, rounded transversely on the edges, and smooth.

The edges of the jaws come together so intimately when the instrument is closed that any tissue interposed between them is completely crushed. Precision in their use is necessary. It is better to crush each spermatic cord separately, and in older animals to crush each cord twice. No after treatment is necessary. The testicles and scrotum are swollen for a few days but the lamb exhibits no systemic disturbance. The swelling soon disappears and the testicles become atrophied.

As mentioned before, precision in use is necessary. An explanation of the incomplete success in a small percentage of cases is that the cords were improperly held and so were not completely crushed. There is a tendency for them to roll away from the jaws of the instrument unless properly held. The big advantage gained by the use of this instrument is that there is no external wound. This should prove invaluable in fly-infested districts or on properties known to be infested with tetanus or blood poisoning germs.

Some flock owners who have had experience in the use of this instrument state that lambs marked in this way thrive better than lambs marked in the usual way. This, they ascribe to the facts that there are no external wounds to heal and that the lambs receive less shock.

The bloodless emasculator.

In castrating older lambs, the use of the emasculator, either the bloodless or the ordinary one, is recommended. It is worth noting also that castration of adult sheep is looked upon as a most unsatisfactory operation with a high mortality rate no matter what method is adopted.

Tail Docking.

As regards docking, the same precautions are necessary with respect to the knives used. The tail is cut off generally at the second joint. Before it is actually cut the skin should be retracted slightly towards the lamb's body by the man holding the lamb. When released it projects over the end of the bone protecting it while healing takes place. Docking of the tail in lambs is often effected by a cautery or searing iron shaped in the form of a spade. By this means haemhorrage is prevented and a barrier is raised against invasion by virulent bacteria.

The operation of tail docking can also be carried out using the bloodless emasculator. As a general rule, better results are obtained using this instrument on younger lambs. The jaws of the instrument are brought together at the required position and the bone is crushed. It is

then necessary to run the knife round the inside curve of the jaws to completely sever the tail; the edges of the skin then remain together.

With strong well-developed lambs it is essential that the tail should not be docked too short with this instrument, as in such cases necrosis or death of the crushed bone and consequent sloughing of the tail up to the next joint almost invariably follows. With such well-developed lambs, i.e., stud lambs being kept with the idea of showing, it is preferable to use the knife and cautery.

If the process of marking is carried out in a clean manner as outlined and the lambs placed on a clean pasture afterwards no dressings are necessary. The use of sticky dressings which hold dust, dirt, and consequently germs can be harmful.

Infection of Wounds.

By far the most common cause of death as a result of wound infection following marking of lambs is tetanus which is caused by *Bacillis tetani.* This germ forms spores and it is the spore which contaminates the wound. These spores are very resistant to destruction and can live in soil and manure for a very long time. Infection of a wound results in a rapid multiplication of tetanus bacilli and the liberation of toxin. This toxin does not give rise to a blood poisoning but affects the nervous system with, almost always, fatal results.

The symptoms of tetanus are shown in from two to fourteen days after infection and are as follows:—The lamb becomes stiff in one or more legs—usually the hind ones—and while it can walk it shuffles along with more or less straight legs. If handled it will be noticed that the body is also stiff and the muscles of the back and loins hard and contracted. Later, the lamb goes down and lies on its side in a typical attitude —with the legs extended and the head and neck drawn back. There are present characteristic muscular spasms and the membrane of the eye is drawn over the eyeball. Tympanitis or bloat is also present. Carcasses of lambs dead from tetanus should be destroyed by burning completely.

Losses are also brought about by blood poisoning. Several different kinds of organism can cause this complaint, but with each, death occurs rapidly. The main point for notice is the fact, that, like the tetanus spore, these germs which cause blood poisoning, are also found in manure dust and soil.

In other cases, infection of wounds can result in conditions such as joint infection which, while possibly not resulting in the death of the lamb, can result in a serious economic loss due to unthrifty lambs.

Summary of Precaution.

Wherever possible use temporary yards on clean pasture. If permanent yards are used, thoroughly clean them prior to use.

Keep the marking board clean.

Sterilize hands and instruments before use and frequently during the operations.

Drop the lambs on to clean pasture and treat them gently.

The correct use of the bloodless emasculator is recommended.

Some of these points may seem trivial, but it must be remembered that the saving of only a few lambs each year will more than repay the breeder for any trouble that may be taken before and during the operation of lamb marking.

Fertilizers Act

Result of Pennell Appeal

THE appeal against the conviction under section 16 of the Fertilizers Act, recorded against Albert George Pennell of Burke-street, Braybrook, as reported in the February issue of this *Journal,* was heard before His Honour Judge Macindoe in the Court of General Sessions on the 29th March.

The appeal was upheld with costs against the respondent, His Honour deciding that the 47 bags of ANA Surprise Animal Fertilizer which were sampled did not constitute a whole lot under the Act but were part of a consignment of 133 bags which was subsequently sent to Shepparton.

Clean Milk and Dairy Farm Competition

Dumbalk District

Report of the Judges, Alex. Mess, Senior Dairy Supervisor, and G. R. Berryman, Dairy Supervisor

Considerable interest was again taken by the dairymen of Dumbalk and surrounding districts in the annual Clean Milk and Dairy Farm Competition, which is conducted by the Dumbalk Co-operative Butter and Cheese Co. Ltd. The competition, which is designed to raise the standard of dairy produce production in the district, is divided into two sections, one for dairy farms with 31 cows or over, and one for farms with 30 cows or under.

Milk, including its by-products, is regarded as one of the most important articles of food, but it possesses one outstanding disadvantage. It can be so readily ruined by dirty and careless methods of handling. On some farms, observation during and after milking operations reveal unclean habits of washing and sterilizing which are dangerous from the point of view of infection by bacteria or germs.

As a result of this fact, all items on the farm which are used in connexion with the production of milk and cream, and also the feeding of the cows, are taken into consideration when judging such a competition. These items include such important factors as water supply for cows, water for cooling milk and cream, washing up water supply; fodder supply for dairy herd; general management of stock; arrangement of farm buildings; manure disposal; conditions of utensils and machinery, and the methods of washing and sterilizing them; the precautions taken to ensure cleanliness and health of stock, relative position of buildings, cowshed, calf pens, barns, stables, pigsties, dog kennels, fowl houses; clean camping ground for cows; roadside shelter for milk and cream; protection of milk and cream from

The milking shed on Mr. J. Beattie's property. Mr. Beattie gained first prize for the best conducted farm of 31 cows and over.

The Dumbalk butter factory.

flies, vermin or dust; clean attire of milkers; effective cooling of cream and its storage until delivery.

It must not be concluded that it is necessary to go to great expense in erecting elaborate buildings so that the factory may be supplied with a high quality article, because *cleanliness* is the all important matter; although it is always a difficult task to keep the badly-constructed buildings in a sanitary condition.

During the competition two inspections are made by the judges between October and the end of January. One pint of milk is collected from each farm during the second judging period, immediately after milking and before straining, and is subjected to the sediment test. All tests wads are pasted on a sheet of paper, and points are awarded according to the degree of sediment on the wad. The results have been of particular interest to competitors.

For this year's competition 24 farms were entered. A pleasing feature was the large number of improvements effected on many farms since the last competition. Prizes for various sections were donated by the following firms:—The Gippsland and Northern Co-op. Co. Ltd., A. Joyce and Co. Pty. Ltd., Rudduck and Co. Pty. Ltd., A. G. Way and Co., Wm. Wells and Co. Pty. Ltd., J. B. Ford and Co., Co-operative Box Co., Salvatis Products, and the staff of the local butter factory.

The Awards.

The first prize for best conducted farm of 31 cows and over was won by Mr. J. Beattie, who was also successful in gaining first prize for the highest number of aggregate points. Mr. Beattie uses a special milk testing cup, imported from England, for the examination of the fore milk from each cow before attaching the milking machine cups. A special rubber brush is also used on this farm for washing the cows' udders and flanks before milking operations. The brush is connected to a water tap in the shed by means of a rubber tube and the bristles are hollow, this allowing the water to flow through them. Both the brush and the special milk testing cup were on view in the Government pavilion at last year's Royal Show, being loaned by Mr. Beattie.

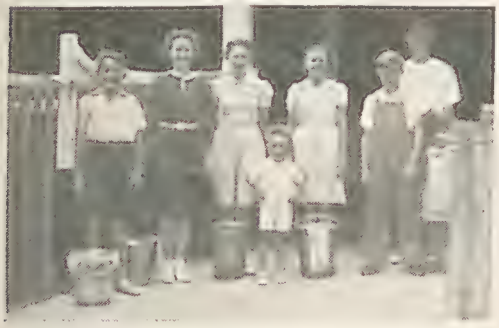
Of special interest on this farm is a 200-ft. bore close to the milking shed, which is on the highest part of the farm. The pump is of the automatic air pressure type, and is driven by

a 1 h.p. electric motor. No storage tank is needed, and the water is run from ball taps at the cattle troughs. The pump starts and stops automatically as the air pressure alters in the cylinder. The water from this bore has a temperature of 58° F, and is laid on to the dairy buildings and six troughs in the paddocks. It is interesting to note that the moment a tap is turned on, the pump commences to operate, thus keeping up the supply of water. Mr. Beattie has recently installed a water pipe line on the floor of the milking shed at the head of the bails, also one in the yard. These have small apertures, 6 inches apart, which spray the concrete floors enabling them to be kept clean and free from dust during milking operations.

Mr. H. J. Hyland, M.L.A., presenting the prizes to successful competitors in the Dumbalk Clean Milk and Dairy Farm Competition.

The cowshed on this farm has a gable roof, the roof extends over a 6-ft. air passage, separating the shed from the separator room, all floors, yards and exits are concreted and well drained, the interior of shed and separator is limewashed twice yearly; a neat detached fly-proof cream room, 6 ft. x 7 ft., on a clean site, ensures freedom from vermin and shed odours. Equipment includes stainless separator parts and milk lines on milking machines, a good washing up trough, drying racks and steam boiler.

The second prize in this section was awarded to Mr. J. B. York, of "Milford Grange," whose shed and buildings are very much the same as those on the winning farm, being separated by a few points only.



A group of Young Farmers at the Dumbalk field day.

The prize for the best farm of 30 cows and under was won by last year's winner of this section, Mr. L. J. Spencer, of Stony Creek. He was also successful in gaining the second award for the highest aggregate number of points. Mr. Spencer's shed is of the skillion roof type with high walls, a 6-ft. air space between shed and separator room. A barn is attached to the shed, with a dust-proof wall between, neatly constructed from car packing cases. These premises are always kept scrupulously clean and sweet, there being ample equipment for carrying out all operations. All surfaces, floors, and receiving yards are concreted, including a 30-ft. concrete drain. An 8,000 gallon concreted underground tank provides plenty of clean water. All cream is cooled and then immediately removed to a well-ventilated cream room; all buildings are enclosed by fences to keep stock from approaching too close.

The second prize for this section was won by Mr. G. H. Bright, of Dumbalk, who also has very satisfactory premises. The milking machines are of stainless steel and the whole milking process is done under vacuum, including the cooling of cream.

The prize for the cleanest sediment test wad went to Mr. J. Trease, of Dumbalk North, and second prize to Mr. O. T. Jones, of Dollar. Mr. Trease's herd is milked by hand, the almost spotless wad indicates a very high standard of cleanliness during the milking operations.

A clean milking competition for boys or girls under 18 years of age was conducted in

conjunction with the main contest. First prize was awarded to Heather Hancock, while second and third prizes went to Alice Ayton and Iris Pearson respectively. An essay on "Cost of producing 1 lb. of butter" created quite a lot of interest, and was won by Doris Bright, with Heather Hancock second, and Robert Hancock third.

The competition was brought to a successful conclusion on 16th February, when a field day was held and prizes presented to the various winners by Mr. H. J. Hyland, M.L.A., Minister of Transport. Addresses were given by Mr. J. M. Kerr, Superintendent of Dairying, and Mr. A. J. Gill, Senior Dairy Inspector.

The Potato Moth Attacks Tomatoes

By R. T. M. Pescott, M.Agr.Sc., F.R.E.S. Entomologist

IN the early part of last month, tomatoes in both the Doncaster and Bendigo districts were severely damaged by a grub, resulting in losses of up to 60 per cent. of the crop. On examination, the insect responsible for the trouble proved to be the Potato Tuber Moth, *Phthorimaea operculella* Zell., a common inhabitant of potatoes, tobacco, egg fruit, and such weeds as nightshades. While the tomato is recorded as a host plant of this insect in other parts of the world, I know of no previous record of such extensive damage accruing to tomatoes in Victoria.

A tomato, cut open, showing damage caused by the potato tuber moth.

Symptoms of Attack.

The fruit is attacked chiefly at the stem end, the young grubs apparently entering the fruit under the protection of the green calyx. A small amount of surface feeding occurs in this sheltered position before the grub finally enters the flesh of the fruit. Damage finally extends towards the centre, producing a similar effect to that of the tomato moth, *Heliothis* (see Figure). This initial injury favours the entry of parasitic fungi and secondary insects.

In the majority of cases, little or no external evidence is present to show that the fruit is damaged while on the plant. It is only on cutting the tomato that the full extent of the damage is noticed. In the Doncaster district, an inspection in the field showed that tunnelling in the stems, and a certain amount of "mining" in the leaves had also occured, these points being typical of this insect on other hosts.

While it is felt that the dry seasonal conditions existing this year have been conducive to the trouble, growers of tomatoes in both of these districts should watch out for this pest in future crops.

Control.

It is suggested that the ordinary 50 per cent. arsenate of lead dust, as applied for the control of the tomato moth, would be effective against this pest, the dust being directed chiefly at the bunches of fruit.

Treatment should commence as soon as the fruit has formed, and should be repeated at weekly intervals for one month.

Potato Manurial Trials

Results for 1939-40

By G. H. Mattingley, Potato Field Officer

Coragulac.

AN excellent piece of black volcanic soil was selected for the site of the Coragulac plots. The paddock had been in grass for many years and had grown one crop only of onions since being broken up. After the onion harvest the land remained in fallow and the dense growth of capeweed that came was ploughed down on top of the potato sets, which were sown on 17th July, 1939. The variety Up to Date was used, the seed being obtained from Beech Forest.

The plot was inspected in December when the potatoes were in flower. On the whole, the general growth was even, although slightly below normal for the time of year. There was no apparent difference between the various manurial treatments and the unmanured plot. Earlier in the season, the plot treated with the "3 + 1" mixture of super. and sulphate of ammonia made the best growth, but was closely followed by that treated with superphosphate 3 cwt. plus ammonium sulphate 2 cwt. per acre. At this stage, also, the unmanured plot was definitely backward in comparison with all others. However, by flowering time all these differences in growth had disappeared, probably because of the period of dry weather.

At harvest time, 9th January, 1940, the ground was very dry and the grub of the potato moth had already caused considerable damage. It should be noted that the figures given in Table I. include the grub-damaged tubers in the gross weight per acre.

Showing a mat of capeweed being ploughed under at Coragulac.

TABLE I.—POTATO MANURIAL TRIALS, CORAGULAC, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	6 0
Super. 2 cwt. per acre	6 0
Super. 3 cwt. per acre	6 8
Super. 4 cwt. per acre	6 8
Super. 3 cwt. + amm. sulph. 1 cwt.	6 13
Super. 3 cwt. + amm. sulph 2 cwt.	6 11

TABLE II.—AVERAGE RESULTS, CORAGULAC, FOR THREE YEARS 1937-38 TO 1939-40.

Manure per Acre.	Average Yield.	Increase due to Manure.	Value of Increase at £5 per ton.	Cost of Manure per Acre.
	T. C.	T. C.	£ s. d.	£ s. d.
No manure	4 5	.. ..	.. ..	.. ..
Super. 2 cwt. ..	4 7	0 2	0 10 0	0 7 6
Super. 3 cwt.	4 8	0 3	0 15 0	0 11 3
Super. 4 cwt.	4 7	0 2	0 10 0	0 15 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	4 14	0 9	2 5 0	1 6 1
Super. 3 cwt. + amm. sulph. 2 cwt. ..	4 8	0 3	0 15 0	1 18 6

Rolling down peas and oats as green manure for potatoes.

This is the third year of the tests at Coragulac, and each has been drier than usual during December and January. Such a contingency however, must be expected and due preparation made in an area like Colac. Each season there has been no suggestion of a significant increase in yield due to manurial treatment. However, until a wider range of seasonal conditions is experienced in the trials, no definite statement may be made regarding manure for potatoes in this district; but we may repeat the observation made last year, that the use of artificial fertilizers seems to be of no advantage at Coragulac in a dry season.

Illowa.

The Illowa plots were sown on 16th August, 1939, on a friable red volcanic soil, that had been down in grass for four years, after having been cropped with potatoes followed by hay, for several years. The seed, which was of the Up to Date variety from the Portland district, was planted under the sod. The soil was very dry and crumbly as the rainfall up to the time of planting had been very scanty. Cold and wet weather followed and retarded the appearance above ground of the crop.

In October, during a dry, hot spell following heavy rains the previous month, pea mite caused considerable damage to the young plants; particularly in rows adjacent to fences and grassy headlands. These attacks, coupled with the cold weather experienced in early September, retarded considerably the growth of the crop. Similar conditions prevailed generally in this district.

During the season, the plot receiving the dressing of super. 3 cwt. and ammonium sulphate 2 cwt. per acre showed to the best advantage among the manured plots, having a stronger top growth and being of a darker green colour. The unmanured plot was not noticeably poorer in growth than any of the "super. only" plots.

The results for this season are given in Table III. From the average results, Table IV., it will be seen that the application of artificial manure definitely produces an economic increase in yield in this class of soil, but, contrary to popular belief, the optimum dressing appears to be 4 cwt. super. only. The addition of sulphate of ammonia is not justified as the increase in yield obtained is not commensurate with the additional cost involved.

TABLE III.—POTATO MANURIAL TRIALS, ILLOWA, 1939-40.

Manure per Acre.	Weight Marketable Tubers.
	T. C.
No manure	5 7
Super. 2 cwt.	4 5
Super. 3 cwt.	5 7
Super. 4 cwt.	6 0
Super. 3 cwt. + amm. sulph. 1 cwt.	6 3
Super. 3 cwt. + amm. sulph. 2 cwt.	6 6

TABLE IV.—AVERAGE RESULTS, ILLOWA, FOR SEVEN YEARS, 1933-34 TO 1939-40.

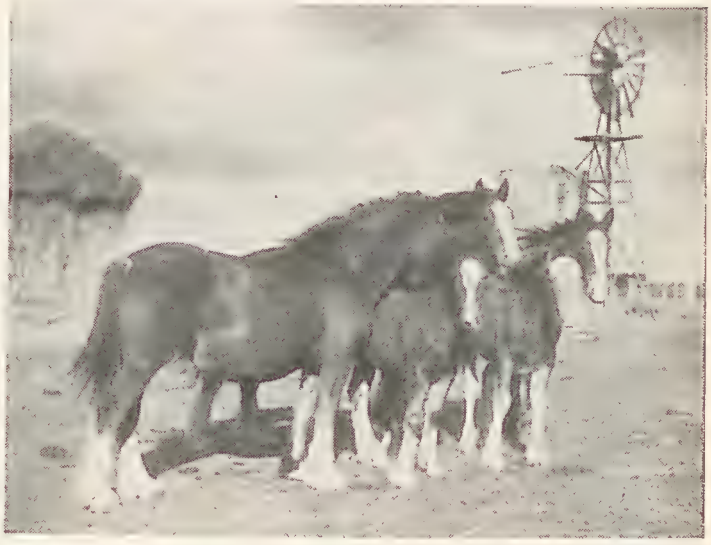
Manure per Acre.	Average Yield.	Increase due to Manure.	Value of Increase at £5 per Ton.	Cost of Manure per Acre.	Extra Return per Acre due to Manure.
	T. C.	T. C.	£ s. d.	£ s. d.	£ s. d.
No manure ..	4 17	..	..	..	..
Super. 2 cwt.	5 6	0 9	2 5 0	0 7 6	1 17 6
Super. 3 cwt.	5 14	0 17	4 5 0	0 11 3	3 13 9
Super. 4 cwt.	5 17	1 0	5 0 0	0 15 0	4 5 0
Super. 3 cwt. + amm. sulph. 1 cwt. ..	5 18	1 1	5 5 0	1 6 1	3 18 11
Super. 3 cwt. + amm. sulph. 2 cwt. ..	5 18	1 1	5 5 0	1 18 6	3 6 6

Registration of Stallions

Twentieth Annual Report

By

R. J. deC. Talbot, B.V.Sc., Chief Veterinary Inspector



CONSIDERATION of the operations of the Horse Breeding Act for the season 1939-40 reveals that the most significant feature was the falling off in the number of three, four, and five-year-old draught stallions which were submitted for examination. This has resulted from the number of tractor units introduced into the wheat belt during the past few years, and also to some extent to the drought of 1938 which, besides acting adversely upon the whole horse-breeding industry, limited the number of yearlings and two-year-old colts which in a normal season would have been kept as entires. During and since the drought, prices of draught stock have slumped to a low figure, but at present, prices are improving particularly for horses of good quality.

In a time of national crisis, economical production is essential, and, therefore, at a time like the present, the cost of power on a farm becomes of increasing importance. With rising costs of fuel, &c., it is becoming more and more apparent that the horse is the most economical power unit for use on the average-sized farm, and it is suggested that farmers, both from their own and from the national point of view, give very careful consideration to the economics of power on the farm and the horse's place in agriculture.

During the season under review the number of stallions registered was 881 draught, 235 light horses, and 172 ponies, a total of 1,288 compared with 1,476 for the season 1938-39. During the season the examining veterinary officers examined stallions at 228 centres including 74 special examinations held at the expense of the owners. As in the previous season, the veterinary staff travelled in the main by motor car, and it was possible to complete all examinations by the first week in August.

During the coming season, stallion owners are urged to present their stallions for examination at a scheduled parade, as it will be impossible to arrange for special examinations until the scheduled parades have been completed.

The number of stallions of all classes examined for the past two seasons is as follows:—

Year.	Draught.	Light.	Pony.	Total.
1939–1940 ..	254 (Decrease 162)	61 (Decrease 27)	60 (Decrease 7)	375 (Decrease 196)
1938–1939 ..	416	88	67	571

Of the number examined this season, 273 were registered and 102 were refused registration. Of the latter, 66 or 17.6 per cent. were rejected on account of unsoundness, and 36 or 9.6 per cent. because they were below a reasonable standard in respect of type, conformation, and/or breeding. The total percentage of rejections was 27.2 per cent. which is about 6 per cent. higher than last year, although it has been exceeded in other years. The percentage of rejections for type and conformation in draughts (9.0 per cent.) is the lowest for thirteen years, and although the number of stallions examined was the smallest since 1931-32, their quality showed a distinct improvement. This is extremely satisfactory and indicates that owners are rearing as colts only those foals from their best quality mares.

SUMMARY OF EXAMINATIONS, 1939-40.

	Draught.		Light.		Pony.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	254	177	61	46	60	50	375	273
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Bog Spavin	2	·787	..	..	..	..	2	·533
Bone Spavin	..	..	1	1·639	..	..	1	·267
Chorea (Nervy)	3	1·181	1	1·639	..	..	4	1·067
Curb	..	..	2	3·279	..	..	2	·533
Ringbone	1	·394	1	1·639	2	3·333	4	1·067
Sidebone	48	18·897	3	4·919	1	1·666	52	13·866
Stringhalt	..	..	..	..	..	..	..	..
Thoroughpin	..	..	..	..	1	1·666	1	·267
Through unsoundness	54	21·259	8	13·115	4	6·665	66	17·600
Through disapproval	23	9·055	7	11·475	6	10·000	36	9·600
Total	77	30·314	15	24·590	10	16·665	102	27·200

SUMMARY OF EXAMINATIONS, 1938-39.

	Draught.		Light.		Pony		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	416	318	88	70	67	58	571	446
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Bog Spavin	3	·721	..	..	..	..	3	·525
Bone Spavin	..	..	1	1·136	1	1·492	2	·350
Chorea (Nervy)	2	·481	..	..	..	..	2	·350
Curb	..	..	2	2·272	..	..	2	·350
Ringbone	5	1·201	1	1·136	..	..	6	1·050
Sidebone	41	9.855	..	..	..	..	41	7·180
Stringhalt	4	·962	..	..	..	..	4	·700
Thoroughpin	2	·481	..	..	..	..	2	·350
Through unsoundness	57	13·701	4	4·544	1	1·492	62	10·855
Through disapproval	41	9·855	14	15·909	8	11·940	63	11·033
Total	98	23·556	18	20·453	9	13·432	125	21·888

The position in regard to unsoundness is not so satisfactory. In the draught class 21 per cent. was rejected on account of hereditary unsoundness, sidebone heading the list with 18·8 per cent. This figure is too high and is undoubtedly due, in some measure, to breeding from unsound mares, and the retention by owners, for use on their own mares, of unsound stallions which have been refused registration. During 1939–40, 124 owners retained unsound stallions, and undoubtedly the section of the Act which permits this does much to increase unsoundness.

Gold Digger (imp.) by Golden Charm ex Silver Jewel by Footprint Renown—the main Clydesdale sire used at the State Research Farm, Werribee.

With regard to the examination of mares, breeders are reminded that, under a voluntary scheme, stud-book mares may be submitted for examination for soundness to the veterinary officer at scheduled parades. A fee of £1 is charged for the examination, and certificates for soundness are issued for three-year-olds and four-year-olds, and a life certificate for mares of five years or over. During the past, many owners have availed themselves of the opportunity of having their mares examined, and it is hoped that during the coming season all stud breeders will present at least some of their mares for examination.

Although, at present, the horse-breeding industry is passing through a period of depression, it may be confidently stated that the draught horse is destined to play an important part in agriculture for many years to come, and farmers would be well advised to make every endeavour to better the quality of their stock even if there appears to be at present little incentive to increase the numbers bred.

Appeals.

Three appeals were lodged against the decision of veterinary officers; one was upheld and the other two were dismissed.

Amendment to the Act.

During the last session of Parliament, the Horse Breeding Act was amended to provide for the registration of two-year-old colts whose owners desired to give them some stud service. The amendment provides that owners must make application for registration on the prescribed form, and the application must be accompanied by a fee of £1. The colt must be submitted for examination at a scheduled parade and if passed will be registered as a colt for one year. The Act was further amended to provide for the return to an owner of fees paid in connexion with an appeal which is upheld.

Parades for Coming Season.

The schedule of parades and list of registered stallions are obtainable on application to the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Application for registration must be made on the prescribed form before the 1st July, and must be accompanied by a fee of £3 (£1 for registration and £2 compensation fee). The necessary forms may be obtained from secretaries of agricultural societies and from officers in charge of police stations, or from the Department of Agriculture.

Change of ownership must be notified without delay in order that certificates of registration may be endorsed accordingly. Registration expires within 30 days of change of ownership unless the required notice is given.

REGISTRATION REFUSED

List of Stallions in respect of which Certificates of Registration have been refused but which, the owners having paid the prescribed fee, may be retained for breeding purposes with owners' own mares

Name.	Age* and Class.	Owner and Address.
Unnamed	A. L.	Max Cole, Kooreh
Unnamed	5 P.	Miss G. Small, Ferntree Gully
Abron Hill Laddie	3 D.	H. L. Badman, Panitya
Alto Bells	A. P.	J. Barty, Redesdale
Argyle Favour	5 D.	Messrs. McLean and J. F. Harrington, Tempy
Ballantrae Prince	4 D.	Messrs. Ballintine Brothers, "Ballantrae," Goorambat
Barney Baron Belmont	A. D.	A. T. Cole, Wodonga
Baron Bold	6 D.	Mrs. D. A. Daly, P.B., Detpa
Baron Prince	A. D.	Geo. Tyler, Box 65, Sale
Bell Boy	A. T.	A. G. Turnbull, Coleraine
Bell Boy	A. D.	H. F. Goldsmith, Corack
Bellman	6 D.	Messrs. H. Wharton, and Bros., Cochrane's Creek
Benambra	A. D.	Messrs. Nankervis Bros., Corryong
Ben Bolt	A. D.	S. Nunan, Wymlet
Ben Kell Reflect	6 D.	N. R. Ralston, Moglonemby
Black Arbuckle	A. D.	G. A. Liersch, Homecroft
Black Baron	6 D.	A. E. Tucker, Mitchell's Hill
Black Star	A. L.	D. Madill, Koyuga South
Bowler	5 D.	A. C. Masters, Corryong
Bruiser	A. D.	Messrs. Smith Bros., Nullawil
Buonaparte	A. D.	W. J. Soutter, Benambra
Campaspe Prince	A. D.	Geo. P. Starke, Kyneton
Cannie Shanter	A. P.	W. Ramsay, Winchelsea
Captain	A. D.	W. Walton, Windermere
Captain Craig	6 D.	R. N. Ronalds, Birchip
Clan MacKenzie	A. D.	J. Purdie, Wunghnu
Clyde	6 D.	Geo. Thomson, Kilcunda
Comedy Boy	A. L.	J. A. McEachern, Nelson
Count Douglas	A. D.	C. A. Lawrence, Apsley
Craigie Don	A. D.	C. Butcher, Chillingollah
Craig Lea	6 D.	V. D. Kallady, Gelliondale
Dandy Bell	A. L.	H. Spice, Bacchus Marsh
Danny Boy	3 L.	W. Meagher, Danyo
Donald	A. D.	Messrs. Snart Bros., Goora-madda
Donibristle II.	A. D.	M. J. Wilson, Milawa
Douglas	A. D.	J. A. McDonald, Gre Gre Central
Drummer	A. D.	F. Bird, junr., Yarram
Duke of Kinarla	A. D.	Messrs. Beacon Bros, Boyeo
East Lynne	5 D.	J. Gibson, Benambra
Ethalldale Scotson	4 D.	H. H. T. Kramer, Lawloit
Fifeness Flash Baron	6 D.	H. L. Treasure, Stratford
Flash Direct	A. L.	C. T. Evans, Rathscar
Gay Dan	5 D.	A. F. Scarce, Linga
Gay Silver	5 D.	S. A. Bull, Paschendaele
Gipps Gold Count	3 D.	C. A. Stuart, Hillside
Glen Brilliant	A. D.	James Hill, Bethanga
Glen George	3 D.	G. Peters, Tallandoon
Glenlock Pride	3 D.	P. O'Keeffe, Wangaratta
Glen McBride	A. D.	H. Jager, Swan Hill
Hector Lee	A. D.	J. S. Carlyon, Wahring
Highland Boy	A. D.	J. J. Carmody, Leongatha
Hill King	A. L.	A. E. Cummings, Berrimul
Huonson II.	A. L.	W. Marke, Girgarre East
Ideal Ambassador	A. D.	C. J. Liesheld, Rainbow
John Henry	A. L.	Messrs. Raymond and Rankin, St. Albans, via Geelong
Kawaran Liston Craig	6 D.	V. O. Frost, Netherby
Kawaran Strathwell	4 D.	G. T. Deckert, Kinimakatka
Keayang	6 D.	James Blain, Dixie
Kimberley Flash Lad	4 D.	O. W. Deckert, Nhill
Kingsford	6 D.	N. Clemens, Myrtleford
Koimba Lad	3 D.	T. L. Lambie, Bolton
Korongan Bold Eric	A. D.	W. R. Hines, Donald
Lieutenant William	A. D.	Messrs. Smith Bros., Echuca
Linkwood Prince	A. D.	V. S. Holt, Kurraca West
Lock	A. D.	G. T. Croxford, Benalla
Lord Roberts	A. D.	R. Wright, Woodside
Lord Victor	A. D.	J. Montgomery, Milawa
Major Dawn	4 D.	F. A. Lehmann, Box 37, Lismore
Major Laddie	A. D.	G. R. Stratton, Echuca
Mallee King	3 D.	S. R. Pearce, Box 31, Woomelang
Maxmay	A. D.	D. S. Stewart, Swan Hill
Mercury	A. T.	O. B. Brown, Cope Cope
Millroom Excelsior	3 D.	J. Tweddle, Murchison East
Naldera Footprint	5 D.	Mrs. S. E. Kent, Sheep Hills
Noble	A. D.	E. Crowe, Tatong
Northwood Flash Lad	3 D.	R. Benson, Lilydale
Pete	A. P.	J. Knight, Goornong
Pettadale's Pride	A. D.	D. Green, junr. Nullawil
Pride of Woomelang	A. D.	Estate of J. A. Kelly, Woomelang
Prince	A. D.	M. Findlay, Mincha
Prince	5 D.	R. A. Estoppey, Briagolong
Prince	A. D.	A. H. Fawson, Bairnsdale
Prince Imperial	A. D.	A. McNee, Nandaly
Prince Raven	A. D.	A. McGarry, Nyarrin
Prince's Prize	A. D.	Messrs. Moran Bros., Bullaharra
Professor	4 P.	Executors, C. L. Forrest, Irrewarre
Proolnga	A. D.	Malook Singh, Mangatang
Punch	A. L.	A. Churchill, Kilcunda
Punch	A. D.	J. Sansom, Bayles
Punch	A. D.	W. Earl, Woodside
Pyjamas	5 P.	Messrs. Boyd Bros., Koroit
Quality Swell	A. D.	C. R. Taylor, Allansford
Radiant Crown	A. D.	A. F. Kruger, Rainbow
Robin Lea	6 D.	Messrs. J. and W. Bradshaw, Skipton
Rob Roy	A. P.	Miss E. A. Small, 67 The Boulevard, Hawthorn
Roc Park Bold Print	5 D.	W. R. P. Hooper, junr., Mickleham
Royal Coast Guard	A. D.	A. J. Millar, Hopevale
Royal Hero	A. D.	Mrs. P. E. Etherton, Broughton
Royal King	A. D.	D. Gorman, Crossley
Royal Mattie	6 D.	J. Kelson, Kirkstall
Royal Prince	4 D.	J. H. Crawford, Victoria Valley, Dunkeld
Sailor	A. D.	A. G. Turnbull, Coleraine
Sam	A. D.	A. G. Turnbull, Coleraine
Scotch Pride	6 D.	J. M. Shelton, Kurraca West
Scotland's Duke	A. D.	H. F. Quick, Brim
Scottie	6 D.	M. McGillivray, Bald Rock
Silver	A. L.	Messrs. H. B. and F. A. Birch, Tabberabbera
Sir Michael	A. D.	E. Lewis, Tatong
Sordino	A. T.	L. Matthews, Benambra
Sunset Trail	A. T.	The Manager, Yarraberb Estate, Raywood
Surprise Power	5 P.	W. T. Jensen, Morwell
The Gaffer	A. L.	G. Phelan, Corop
The Major	A. P.	L. C. Mortimer, Leneva
Tiger	A. D.	Executrix of the Estate of the late J. L. Morrison, Boinka
Waldaira's King Knight	A. D.	Messrs Boyd Bros., Koroit
Warrangee Oswald	A. D.	Geo. Lord, Eskdale
White Flash	A. P.	H. Buxton, Stradbroke
Widgiewa Alverton	A. D.	J. O'Leary, Glenormiston South
Worawingeth Allenby	5 D.	W. T. Rowe, Wallinduc
Worthy Glen	6 D.	C. Hefferman, Iona
Wotan	3 D.	F. Muller, Burrowye
Yangery Prince	A. D.	A Skilbeck, Southern Cross
Young Lockland	5 D.	C. C. Jenkins, Hopetoun
Young Toby	A. D.	W. J. Newton, Lower Cape Bridgewater

* *Note.*—Age in years. A., aged; D., draught; L., light; P., pony; T., thoroughbred.

Live Stock Notes

Reminders for May—June

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Vitamins and Cod Liver Oil.

VITAMINS are food accessories which promote the efficient utilization of food for growth and production, and which increase resistance to various diseases. At least five vitamins are generally recognized, and two of these, vitamins A and D, are sometimes deficient in live stock rations.

As a source of vitamins A and D, cod liver oil has been used more and more in the rations of live stock, particularly poultry, and concern is now being experienced by many farmers because, as the result of the war, only limited supplies are available and the cost has been considerably increased. To meet the demand from farmers, some firms, importing cod liver oil, have been exploring the possibilities of substituting various products such as whale oil, fish meal, mixtures of fish meal with linseed, cottonseed, castor and olive oils, and even honey, but it must be pointed out that these oils and foodstuffs have no value as substitutes for cod liver oil. The value of various fish oils has also been ascertained as a source of vitamins A and D, and, in this respect, pilchard oil, known commercially as Pilchardene, has a high vitamin content and can be used as a substitute for cod liver oil. Shark oil, cod oil, and other fish oils are often used to dilute cod liver oil, but they have no value as a source of vitamins.

Small shipments of Solvitax are now coming to hand and these new supplies have a vitamin content standardized to contain not less than 850 international units of vitamin A per gram, and 85 of vitamin D (850 A and 85 D). Pilchardene is said to contain 800 A and 100 D. Actually, there should be very little need for alarm over the shortage of cod liver oil because, by a small adjustment to the rations and husbandry, a full supply of vitamins from natural sources can be maintained.

Vitamin A can be readily manufactured by the animal from carotene. Carotene is abundant in all forms of greenstuffs and carrots, while it is found in moderate quantities in yellow maize, all fresh grain and most fresh fodders in general use. Deficiencies in vitamin A are most common among poultry and pigs which are fed for long periods on grain which has been stored for at least a season, and bran and pollard or other meals made from such stored grain, and, in addition, have not received any greenstuff. Deficiencies in vitamin A can be wholly overcome if the farmer feeds a liberal quantity of succulent greenstuff to his birds and animals and endeavours to secure other foodstuffs which have been grown during the current season.

Vitamin D, the vitamin which prevents rickets, has a very limited distribution in common foodstuffs, but it can be formed in the skins of animals by exposure to sunlight. In the construction of fowl houses and pig sties, a design should be followed whereby plenty of sunlight will shine directly upon the enclosed animals.

Vitamin deficiencies very seldom occur amongst horses, cattle, and sheep, partly because of the variety of foods they are given, but more particularly because they are exposed to sunlight such a lot and because they are grazed on green pastures for a considerable portion of the year. In pigs, vitamin deficiencies are also rare because the dry sows are usually grazed out in the sunshine on pasture for considerable periods of the year, and such sows transfer a sufficient quantity of vitamins to their progeny to carry them to bacon weights without any additional rich vitamin supplement. Laying fowls, which usually are enclosed and fed continuous rations of perhaps wheat in the evenings and bran and pollard in the mornings, are particularly subject to vitamin deficiencies.

Occasionally mysterious nutritional problems arise which cannot be accounted for and yet which have been corrected by feeding cod liver oil, but cod liver oil should always be very sparingly fed to pigs and dairy cows, because

it causes a soft lard with a fishy flavour in pigs, and greatly reduces the butter-fat content of the milk of dairy cows. The feeding of sufficient greenstuff and the exposure of the animals to plenty of sunlight is recommended wherever possible for all classes of live stock as a safeguard against vitamin deficiency.

Dairy Cattle.

The one bright feature about the prospects of maintaining the herd in good condition and at a reasonable level of production during this winter is the fact that large reserves of hay and silage are held on most farms. The dry autumn and late break in the weather have been most discouraging and winter pasturage will be scarce. Most farmers who depend solely upon pasturage for the wintering of their dairy stock will have a lean season unless they procure some supplementary fodder. Fortunately, feed is offering at reasonable prices.

On most farms hand-feeding should already have commenced. Hay and silage should comprise the bulk of the supplementary rations and, to prevent waste, these fodders should be fed in racks and troughs individually to the bailed cows. Any fodder left over by the heavy milkers should be removed daily and immediately given to the dry cows or low producers, which should be fed less liberally. It is also advisable to give a protein-rich supplement such as linseed meal, coconut meal, meat meal, bran or polly feed to the best cows.

Hay and silage often are spread out on the ground for the cows, but this practice is not recommended because waste occurs through trampling, and the strong, bossy cows will gulp down some food and then walk about in search of more palatable mouthfuls, interfering with the weaker and more timid animals. In districts where fodder is scarce, farmers with reserves should not be tempted to sell fodder that they are likely to require themselves.

The early heifer calves should be retained and reared for herd replacement purposes as they will be better grown before calving as junior-two-year-olds. These calves will require dry living quarters, free from draughts, and opening out on to a calf paddock. They should be fed about 1 lb. of new milk (3.5 to 4.0 per cent. butter-fat) twice daily for each 10 lb. liveweight for three to five weeks and then gradually be put on to skim milk or other suitable substitute. Calves should also have access to clean drinking water and supplementary feed where necessary.

In the selection of bulls for the breeding season, which usually extends from May to November, farmers are advised to choose animals that will conform to the Cattle Breeding Act. Such bulls must show distinct breed characteristics, be of good conformation, and be from dams with a high butter-fat producing performance.

From now until September, it is advisable to rug all newly-calved and high-producing cows. Cheap waterproof rugs are found to be as satisfactory as heavily lined, more expensive ones. Even bag rugs soon become impregnated with oil from the skin of the cow and serve the purpose.

Sheep.

One important feature in connexion with the lambing season which, in Victoria, extends from April to August, is lamb marking, when the following points should be observed:—

(1) Use fresh, temporary yards.

(2) If permanent yards are used, clean them thoroughly before each marking.

(3) Keep the marking board scrupulously clean.

(4) Sterilize all instruments immediately before each marking, and then disinfect the hands and instruments constantly during use.

(5) Drop the newly-marked lambs on to clean pasture.

(6) Finish marking early each day.

(7) Never mark on very windy, cold, or hot days.

Lambs should be marked when two weeks old, although strong lambs can be marked at four days old.

Stud breeders are reminded that there will be no Melbourne Royal Show this year, but the Australian Sheepbreeders' Association is conducting its annual sheep show about the end of July at Dalgety and Co's. Warehouses, Newmarket, Melbourne, where ample accommodation is available for any large increase in entries. The selection and preparation of the show team should commence at once (Mr. N. A. Bowman, Sheep and Wool Expert).

Poultry.

The pullets should now be laying heavily and it will be necessary to see that they are well fed on rations similar to those recommended last month. The birds should be kept under healthy and dry conditions. To combat red mite, all perches and pens should be disinfected before work with the incubators and chickens is commenced.

Before the breeding season commences, all breeding pens should be put in order and the incubators and brooder houses thoroughly cleaned and tested to see that they are working properly. The breeding season will commence in June, and, before mating, a final selection of the breeding stock is desirable, as only the best birds should be retained as breeders. To ensure a large supply of fertile eggs, the breeding stock must be well looked after and fed liberally with standard rations of good quality. All eggs retained for hatching should be carefully selected for size, shape, and texture of the shell to ensure good and strong chickens.

A very comprehensive and profusely illustrated book on poultry farming is published by the Department. This publication deals with every aspect of poultry keeping, from the establishment of the industry to the marketing of the eggs and birds. Chapters dealing with the various diseases of poultry and the management of turkeys, ducks, and geese are also included. The book is obtainable from the Director, Department of Agriculture, Melbourne, C.2. Price 2s. 6d. (2s. 9d. posted). (Mr. H. F. Clinton, Poultry Expert.)

Bees.

A thorough examination of all colonies in the apiary should be made and conditions noted for future reference. Supers containing surplus combs should be removed and the lids of all hives securely fitted to withstand the cold winds and rain. In the case of weak colonies, hive entrances should be reduced to the space of 2 inches, but any very weak colonies should be united to stronger ones as it is not advisable to try to winter such hives under normal conditions. All surplus super combs should be graded and the better grades carefully stored for use in the spring, while inferior combs should be boiled down for wax, and the frames re-wired ready for fitting the foundations as required during the next season.

Sufficient food should be given to all colonies which have insufficient honey stored for the winter requirements. (Messrs. J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.)

Horses.

As colder weather will be experienced from now on, working horses not already clipped should be attended to. Horses will do better when working if the bodies are clipped while the legs can be left unclipped. When idle, clipped horses should be rugged but they should always be rubbed dry before the rugs are placed in position.

In the colder months, the ration should be increased as more food is required to maintain body temperature. The addition of two tablespoonfuls of carron oil in the feed three times daily for working horses has been found of benefit. Stabled horses may be fed hay at night.

Horses at grass should have their teeth and hoofs attended to, and to supplement poor pasture, hay can be fed to them, preferably in racks.

The annual stallion parades commence on 1st July, and stallion owners are reminded that applications for registration must reach the Chief Veterinary Inspector before 30th June.

During the last session of Parliament the Horse Breeding Act was amended to provide for the registration of two-year-old colts whose owners desire to use them for stud service. Owners are reminded that application for the registration of colts should be forwarded to the Chief Veterinary Inspector before the 30th June. Owners who intend parading colts or stallions are advised to have them well groomed and handled to facilitate the work of the inspecting veterinary officer. If not already in hand, this preparation should commence immediately. (Mr. W. D. Shew, B.V.Sc., Senior Veterinary Officer.)

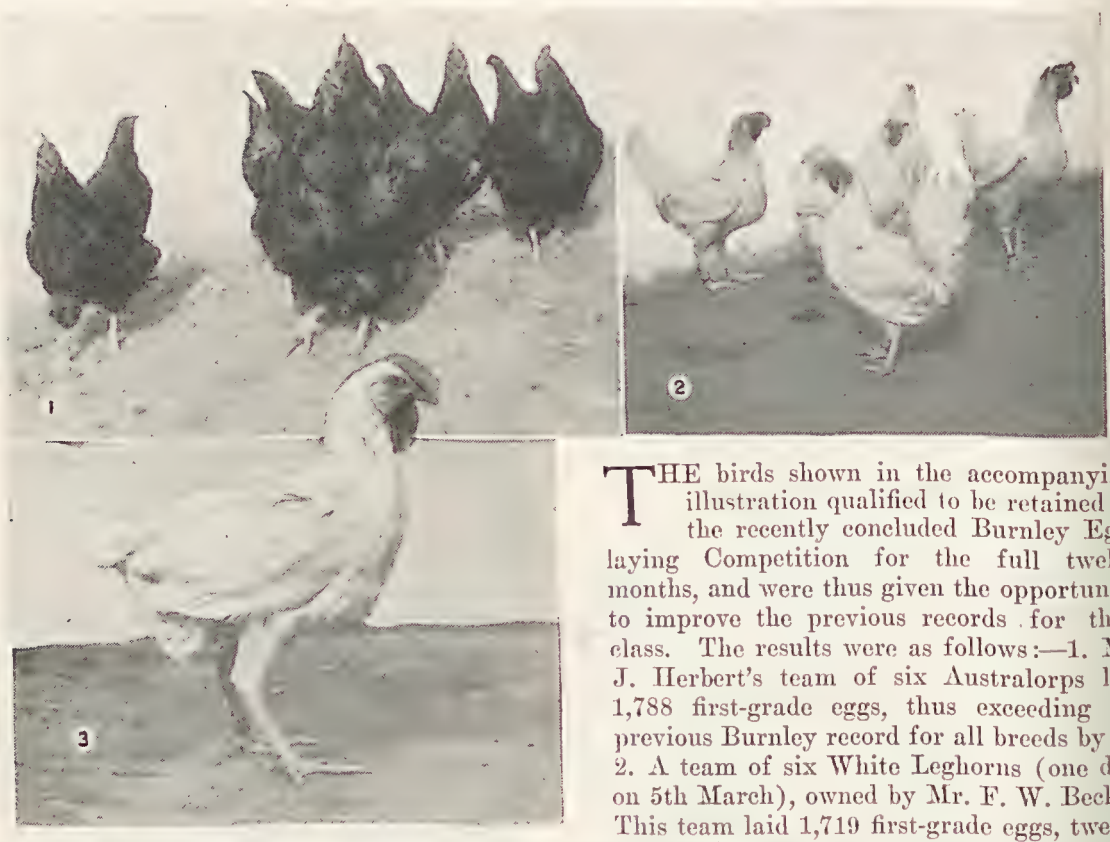
Pigs.

To give farmers an opportunity to secure good, young, purebred boars and sows, the Victorian Branch of the Australian Stud Pig Breeders' Society is conducting a sale for pigs under 16 months old in a building loaned by the Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., adjacent to their works at Braybrook, Melbourne, on 18th, 19th and 20th September. The building is one that is normally used for holding sheep and fat lambs, and pigs entered for sale will not come in contact with or be housed in pens used by pigs intended for slaughter.

The Bacon and Pork Carcase Competitions, inaugurated at the Melbourne Royal Show last year are being conducted in conjunction with this sale. Breeders desiring to offer pigs must submit their entries to the Australian Stud Pig Breeders' Society by 17th August. The sale will be conducted in place of the stud pig sales usually held in conjunction with the Melbourne Royal Show.

Burnley Egg Laying Competition

New Records Established



THE birds shown in the accompanying illustration qualified to be retained in the recently concluded Burnley Egg-laying Competition for the full twelve months, and were thus given the opportunity to improve the previous records for their class. The results were as follows:—1. Mr. J. Herbert's team of six Australorps laid 1,788 first-grade eggs, thus exceeding the previous Burnley record for all breeds by 54. 2. A team of six White Leghorns (one died on 5th March), owned by Mr. F. W. Becker. This team laid 1,719 first-grade eggs, twenty more than the previous Burnley record for a team of White Leghorns. 3. Mr. D. Granter's White Leghorn laid 314 first-grade eggs, but failed to break the previous Burnley record for a single bird of any breed.

Wireless Talks for Farmers

WITH the co-operation of the Australian Broadcasting Commission, the Victorian Department of Agriculture is conducting a series of wireless talks on subjects of particular interest to the man on the land. These talks are being broadcast from the regional stations, 2CO (Corowa), 3GI (Gippsland), and 3WV (Horsham) on Friday evenings, the 15-minute sessions commencing at 7.45 p.m.

The next talks will be on 7th and 21st June and 5th and 19th July.

Listeners desiring any information connected with the management of their farm should send a letter to Mr. J. Keane, B.Agr.Sc., Department of Agriculture, Melbourne, and a reply will be given over the air. If you do not desire your name broadcast use initials or a nom-de-plume, but do not omit to mention your district.

The Cool Storage of Plums*

Progress Report

By F. E. Huelin, Ph.D., B.Sc. (Council for Scientific and Industrial Research), and G. B. Tindale, B.Agr.Sc. (Department of Agriculture).

For some years, cool storage and gas storage experiments with plums have been proceeding at the Government Cool Stores, Melbourne. This article is in the nature of a progress report, as the result of earlier experiments have been reported previously. (1 & 2).

A plum orchard in the Goulburn Valley.

The object of the experiments is to find some means of developing on sound lines an export trade in plums, of which there is a surplus production in Victoria. A small export trade in fresh plums has developed in recent years, but it can scarcely be regarded as sound, for although it is not difficult to land plums overseas in an apparently sound condition, it generally happens that the plums either fail to ripen normally, or develop more or less serious internal disorders within a few days of discharge from ship. The merchants are aware of this fault in Victorian plums and sell them as soon as possible, often while they are still cold. It is the consumer who has to bear the loss due to any subsequent development of disorders, but if not too seriously affected, the plums are suitable for culinary purposes. At present very few plums exported ripen to dessert quality, and hence the trade is based on a culinary article.

The earlier plum storage experiments showed that—

(*a*) Storage disorders developed in plums as the result of storing too long at low temperatures (in the range from 32° to 40°F.).

(*b*) The period which plums could withstand at low temperatures before storage disorders developed varied widely with variety.

(*c*) The longest storage life was obtained by storing initially at 32°F. followed by storage at the minimum ripening temperature which approximates to 45°F. for most varieties.

The experiments carried out in 1939 were designed, in the main, to confirm these earlier findings. Nine of the leading varieties were obtained, each at two stages of maturity. For each variety the second picking was made approximately one week after the first.

The ground colour, blush, and firmness of each variety at each picking is set out in Table I, together with picking dates. The firmness is given in lb. pressure required to

* The work reported in this paper has been carried out by the Victorian Department of Agriculture and the Council for Scientific and Industrial Research in co-operation. It was initiated and supervised by the Advisory Committee on Fruit Storage Investigations, comprising Dr. W. J. Young, Melbourne University and C.S.I.R., Messrs. S. Fish, and F. M. Read, Victorian Department of Agriculture, and Dr. J. R. Vickery, C.S.I.R.

force the 5/16 in. diameter plunger of the Standard U. S. penetrometer into the flesh of the plum after removing the skin.

As a rough guide to maturity it may be stated that the second stage of maturity corresponded to the stage when plums are ordinarily picked for local marketing, that is when the plums are fully grown, but still quite firm and with some degree of juice, flavour and sweetness. The first pick was more or less lacking in flavour and juice, and was inclined to be sour.

After picking, the plums were promptly stored at a temperature of 32°F., and, at weekly intervals, samples were removed to both 60°F. and 45°F. for ripening. Plums will not ripen at 32°F., hence the necessity for removal to a ripening temperature. These ripening temperatures were chosen because 60°F. corresponds to the temperature to which plums are exposed when removed from cool storage for local marketing, while 45°F. approximates to the temperature to which plums are exposed in England after removal from the ship.

As in previous years' experiments, it was found that weekly removals from 32°F. to the ripening temperatures ripened with full development of blush, flavour, and juice up to a certain time, and thereafter failed to do so. The maximum period a variety could be stored at 32°F. and still ripen normally when subsequently removed to a ripening temperature is termed the storage life at 32°F. When stored beyond this period, storage disorders develop on removal to ripening temperatures. If considerably overstored, the storage disorders will develop at 32°F.

The storage disorders associated with overstored plums are mealiness of the flesh, or brown discolouration of the flesh associated with objectionable smell and taste. Should the plums be only slightly overstored, these disorders will be scarcely noticeable, but the plums will fail to develop normal juice and flavour when ripening is attempted.

The results of the 1939 experiments confirm the results of earlier trials in demonstrating the enormous difference in the storage life of the various varieties. For instance, the storage life of the Cole's Golden Gage, when stored at 32°F. and ripened at 60°F. is ten weeks, compared with only five weeks for the President variety.

Moreover, varieties with a short storage life, similar to the President, develop serious disorders if overstored at 32°F. even for one week, whereas varieties with a long storage life, such as Cole's Golden Gage, may be overstored at 32°F. for three weeks before storage disorders become serious.

The results of the 1939 storage and ripening experiments are set out in Table II. The table shows the maximum periods for which both maturities of all varieties may be stored at 32°F. for full quality to develop when ripened at both 60°F. and 45°F. It also sets out the time to ripen at both 60°F. and 45°F.

TABLE I.—COLOUR AND FIRMNESS OF PLUMS AT PICKING, 1939.

Variety.	Maturity.	Picking Date.	Ground Colour.	Blush.	Firmness.
					lb.
Wickson	1st	11.1.39	Green-yellow		12
	2nd	18.1.39	Pale yellow		7
Jefferson	1st	11.1.39	Green-yellow		8
	2nd	18.1.39	Pale yellow		6
Cole's Golden Gage	1st	17.1.39	Green		14
	2nd	24.1.39	Green-yellow		8
Satsuma	1st	19.1.39		Dull red	6
	2nd	26.1.39		Full red	6
Golden Drop	1st	13.1.39	Green		11
	2nd	20.1.39	Pale yellow		9
Narrabeen	1st	18.1.39	Green-yellow		11
	2nd	18.1.39	Green-yellow	Red tip	9
Shipper	1st	23.1.39	Green-yellow		10
	2nd	23.1.39	Green-yellow	Red tip	10
Grand Duke	1st	2.2.39	Flesh green-yellow	75 per cent. blue	11
	2nd	14.2.39	Flesh yellow	100 per cent. blue	9
President	1st	6.2.39	Flesh green-yellow	95 per cent. purple	7
	2nd	13.2.39	Flesh yellow	100 per cent. purple	7

TABLE II.—STORAGE LIFE OF PLUMS IN AIR, 1939.

Variety.	Maturity.	(A) Storage Life at 32°, when Ripened at 60°.	(B) Time to Ripen at 60°.	A + B	(C) Storage Life at 32°, when Ripened at 45°.	(D) Time to Ripen at 45°.	C + D
		Weeks.	Weeks.	Weeks.	Weeks.	Weeks.	Weeks.
Wickson	1st	5	2	7	2	6	8
	2nd	4	1	5	2	5	7
Jefferson	1st	3	2	5	..	..	..
	2nd	4	1	5	2	3½	5½
Cole's Golden Gage ..	1st	9	2	11	7	6	13
	2nd	10	2	12	8	5	13
Satsuma	1st	3	1½	4½	3	5	8
	2nd	5	1	6	4	4	8
Golden Drop ..	1st	9	2½	11½	6	6	12
	2nd	4	2	6	3	6	9
Narrabeen	1st	8	2	10	7	5	12
	2nd	8	1½	9½	7	5	12
Shipper	1st	9	1½	10½	6	5	11
	2nd	9	1½	10½	6	5	11
Grand Duke	1st	5	1½	6½	4	5	9
	2nd	6	1½	7½	4	5	9
President	1st	4	2	6	4	6	10
	2nd	5	2	7	3	6	9

after being stored for the maximum period at 32°F., together with the total time the plums can be held when the maximum storage period at 32°F. is added to the ripening period at both 60°F. and 45°F.

It should be mentioned that after five weeks at 45°F. (which is the average time to ripen) most varieties are eating ripe, but the plums ripened at this temperature are still firm to handle and in this respect differ from plums ripened at high temperatures, say 65°F. When ripened at 45°F. softening is hardly noticeable for the first three weeks.

Discussion of Results.

The results of these experiments have a particular bearing on the problem of plum export. When considering export it is necessary to take into consideration the following:—

(*a*) The export period is approximately six weeks, made up of approximately one week in cool storage for pre-cooling and awaiting shipment, and approximately five weeks on board ship.

(*b*) On arrival in England, the plums are exposed to a temperature of about 45°F. which is the prevailing atmospheric temperature at that time of the year.

From Table II. it will be seen that the Cole's Golden Gage variety can be kept for seven to eight weeks at 32°F. and still ripen normally at 45°F. This storage life is quite sufficient to enable the variety being successfully exported under present conditions where the plums are carried at 32°F. throughout the voyage.

However, the Cole's Golden Gage variety is not widely grown at the present, and the problem at the moment is to find a way of successfully exporting those varieties which are today widely grown and of which the Grand Duke variety is probably the most important.

Shipped under present conditions of 32°F. throughout the voyage, and then exposed to 45°F. on arrival in England, the Grand Duke variety is overstored at 32°F. by two weeks, and, therefore, fails to ripen normally. Usually it lacks quality only, but sometimes develops internal disorders. The limit at 32°F. for this variety when ripened at 45°F. is four weeks, so allowing a period of one week for pre cooling and awaiting shipment, the period on board ship at 32°F. should be limited to three weeks, after which the temperature should be raised to 45°F. This is the minimum ripening temperature to prevent storage disorders from developing after the plums had been four weeks at 32°F. and it would, therefore, be a mistake to raise the temperature to a lesser degree. If the temperature was raised to 40°F. instead of 45°F., the result would be that storage disorders would develop more quickly than if the plums were left at 32°F. for the whole voyage.

Having decided on conditions for export to suit the main variety, consideration is then necessary to determine whether these conditions would be suitable or not for other varieties. Table II. shows that, in order to obtain satisfactory ripening at 45°F., the Wickson variety cannot be stored longer than two weeks at 32°F. Hence export conditions suited to the requirements of the Grand Duke variety would be quite unsuitable for the Wickson variety. Indeed the very short storage life at 32°F. of Wicksons render them quite unsuited for export, and this conclusion is supported by the results of previous experiments.

The Satsuma and President varieties have a storage life at 32°F. when ripened at 45°F., slightly less than the Grand Duke variety, and it would, therefore, seem that export conditions suitable to the Grand Duke variety should also be suitable for these varieties. However, should the Satsuma or President varieties be overstored at 32°F. by only one week, they will develop internal disorders, while the Grand Duke variety may be overstored at 32°F. for two weeks before internal disorders develop. (Slightly overstored plums merely fail to develop full quality on ripening, and being free from internal disorders, still have a definite market value).

From this it will be seen that the export conditions designed to suit the Grand Duke variety leave no "margin of safety" for the Satsuma and President varieties, and hence the export of these two varieties, under conditions designed to suit the Grand Duke variety, must be regarded as risky. There would be less risk if the plums were held at 32°F. for only three weeks (one week before shipment for pre-cooling &c., followed by two weeks on shipboard), but under these conditions the plums would be more forward on discharge.

Apart from the Wickson, Satsuma and President, all other varieties under trial have a storage life equal to, or better than, the Grand Duke variety, and, therefore, could be safely shipped with it. Such varieties include Cole's Golden Gage, Golden Drop, Reine Claude de Bavay, King Billy, Narrabeen and Shipper. Not all of these varieties were tried during 1939, but were included in earlier experiments. In 1939, the Jefferson variety had only a short storage life and did not ripen properly at 45°, but in previous years kept as well as the better keeping varieties. The 1939 Jeffersons were not normal, the trees being severely drought-stricken.

Effect of Maturity on Keeping Quality.

For most varieties the second maturity was picked one week later than the first maturity. Generally speaking there was very little difference in storage life between maturities, but the second maturity ripened with much better quality than the first maturity. The comparatively long storage life of the first maturity of Golden drop plums compared with the second requires some comment. As the result of the drought both pickings were very small and of poor quality and failed to ripen with true Golden Drop quality, and hence the figures given can be regarded as approximate only.

Experimental Shipment.

It may be mentioned here that following on earlier results, growers arranged an experimental shipment of plums to England on the *Brisbane Star* leaving Melbourne on 1st of February, 1939.

Briefly, arrangements were made to carry the plums for the first two weeks at 32°F. after which the temperature was raised to 45°F. The results of the experimental shipment are fully reported in the July, 1939 issue of this Journal and need not be repeated here. However, it may be mentioned that when shipped under these conditions storage disorders were overcome and the plums ripened normally. They were somewhat too advanced, however, for the liking of the trade, but this might be remedied by holding at 32°F. on board ship for three weeks instead of the two weeks, in which case the period at the ripening temperature 45°F. would be reduced by one week.

Gas Storage.

Experiments with the gas storage of plums have been proceeding since 1935, and brief reference was made to them in an earlier report. During 1939, the scope of the work was increased, both maturities of the varieties listed in Table III. being stored at 32°F. under the following conditions:—

(*a*) 5 per cent. CO_2
(*b*) 10 per cent. CO_2
(*c*) 5 per cent. CO_2 for the first three weeks and then transferred to air.
(*d*) 10 per cent. CO_2 for the first three weeks and then transferred to air.

(*c*) and (*d*) were included because previous work with other fruits had indicated that gas storage might be more beneficial if applied for an initial period only, than if applied continuously.

These atmospheres were obtained by the method of controlled ventilation. Fruit when picked continues to respire taking in oxygen and giving off an equivalent volume of carbon dioxide. When fruit is placed in a closed gas-tight container as in gas storage, the respiration of the fruit causes a reduction in the oxygen content of the container and a corresponding increase in the carbon dioxide content.

In the normal atmosphere there is 21 per cent. oxygen and practically no carbon dioxide. In the gas-tight chamber in which fruit is stored, by the time the oxygen has fallen to 16 per cent. the carbon dioxide has risen to 5 per cent. If it is desired to maintain the atmosphere at this concentration of carbon dioxide, it is necessary to ventilate with outside air, and by accurately controlling the ventilation it is possible to prevent either an increase or decrease in the carbon dioxide content of the container.

Samples of all varieties were removed weekly from all gas storage treatments to two ripening temperatures 60°F. and 45°F., to determine if ripening would proceed normally or not. These removals were made at the same time as the removals from air storage to these two ripening temperatures, the latter being regarded as the controls for the gas storage treatments.

The method of determining storage life in gas storage was the same as that adopted for determining storage life in air. The results are set out in Table III.

Discussion of Results.

The figures give the storage life at 32°F. in weeks when stored in air and gas storage when ripened both at 60°F. and at 45°F. The figures in brackets denote the storage period at 32°F. when disorders first appeared after the samples were transferred to the ripening temperatures.

Comparing first the relative merits of the four gas storage treatments it will be seen that the results of all four treatments are much alike, i.e., 10 per cent. CO_2 in the storage atmosphere gave results no better than 5 per cent. CO_2, nor did initial storage in 5 per cent. and 10 per cent. CO_2 give better results than continuous storage in these atmospheres.

More positive comparisons are possible when comparing the storage life in "gas" with that in air.

It will be seen that gas storage increased the storage life of the Cole's Golden Gage variety by one to two weeks. (This is the least susceptible variety to storage disorders when stored in air.)

There was also an indication of a slight increase in storage life of the Satsuma variety when gas stored and ripened at 60°F., but not when ripened at 45°F.

Table III.—Gas Storage of Plums, 1939.

Variety.	Maturity.	Storage Life when Ripened in Air at 60° (Weeks).					Storage Life when Ripened in Air at 45° (Weeks).				
		In Air.	In 5 per cent. CO_2.	In 10 per cent. CO_2.	In 5 per cent. CO_2 Three Weeks, then Air.	In 10 per cent. CO_2 Three Weeks, then Air.	In Air.	In 5 per cent. CO_2.	In 10 per cent. CO_2.	In 5 per cent. CO_2 Three Weeks, then Air.	In 10 per cent. CO_2 Three Weeks, then Air.
Wickson	1st	5 (6)	5 (8)	7 (9)	6 (8)	6 (9)	2 (4)	2 (6)	2 (7)	(5)	(7)
	2nd	4 (5)	3 (4)	2 (3)	..	..	2 (3)	1 (2)	..	..	..
Jefferson	1st	3 (4)	2 (3)	2 (3)	(4)	(4)	Failed to Ripen.				
	2nd	4 (6)	2 (3)	2 (3)	(4)	(4)	Failed to Ripen.				
Cole's Golden Gage	1st	9 (15)	11 (17)	11 (17)	11 (16)	9 (15)	7 (13)	9 (14)	9 (14)	9 (14)	9 (12)
	2nd	10 (13)	11 (14)	11 (14)	11 (14)	11 (13)	8 (10)	9 (13)	9 (13)	10 (12)	10 (11)
Satsuma	1st	3 (4)	5 (7)	5 (8)	4 (6)	4 (6)	3 (5)	3 (6)	3 (6)	3 (5)	3 (6)
	2nd	5 (6)	5 (8)	5 (6)	6 (8)	6 (7)	4 (5)	4 (5)	4 (6)	4 (6)	4 (6)
Narrabeen	1st	8 (11)	4 (6)	4 (6)	5 (7)	6 (8)	7 (11)	4 (7)	3 (8)	5 (8)	4 (9)
	2nd	8 (11)	4 (6)	4 (6)	5 (7)	5 (7)	7 (9)	3 (5)	3 (5)	4 (6)	4 (8)
Golden Drop	1st	9 (13)	4 (5)	4 (8)	4 (8)	4 (8)	6 (12)	3 (7)	1 (3)	..	..
	2nd	4 (7)	3 (6)	3 (6)	(7)	(6)	3 (5)	2 (3)	2 (4)	..	..
Grand Duke	1st	5 (7)	5 (7)	6 (8)	5 (8)	5 (9)	4 (6)	3 (6)	3 (6)	3 (6)	3 (6)
	2nd	6 (9)	6 (9)	6 (11)	6 (11)	6 (11)	4 (8)	3 (8)	4 (9)	4 (8)	3 (8)
President	1st	4 (5)	3 (4)	3 (4)	(4)	(4)	4 (5)	2 (3)	2 (3)	..	..
	2nd	5 (6)	2 (3)	2 (3)	..	..	3 (4)	2 (3)	1 (2)	..	..

The storage life in the various atmospheres is the maximum time the plums can be stored in these atmospheres and ripen normally when transferred to the ripening temperatures.

The figures in brackets give the storage period when disorders first appear when samples are transferred to the ripening temperatures.

Note.—Storage temperature for all atmospheres, 32°.

TABLE IV.—GAS STORAGE OF PLUMS, 1935–38.

Variety.	Date of Picking.	Storage Temperature.	Storage Life in Weeks.			
			Air.	2 per cent., CO_2; 19 per cent. O_2.*	5 per cent., CO_2; 16 per cent. O_2.*	10 per cent., CO_2; 11 per cent. O_2.*
King Billy	6.1.36	32°	9	3	3	3
	11.1.38	32°	4	..	4	4
	11.1.38	45°	6†	..	6†	4
Satsuma	6.1.36	32°	8	8	8	8
October Purple ..	15.1.36	32°	6	5	5	5
Narrabeen	12.1.36	32°	5	3	3	3
Ballena	24.1.36	32°	6	6	6	6
	24.1.36	37°	3	3	4	6
Magnum Bonum ..	24.1.36	32°	8	5	5	5
Grand Duke	24.1.36	32°	8	7	7	7
	24.1.36	37°	6	5	5	5
Golden Drop	31.1.35	34°	7	..	6	6
	24.1.36	32°	8	6	6	6
	24.1.36	37°	4	3	3	3
	9.2.37	32°	7	..	5	4‡
	9.2.37	45°	6†	..	5	4
President ..	31.1.35	34°	5	..	3	3
	31.1.36	32°	5	4	4	4
	31.1.36	37°	2	2	2	2
	9.2.37	32°	5	..	3	3‡
	9.2.37	45°	5†	..	2	2

* Atmospheres obtained by the method of controlled ventilation.

† Time to ripen in storage. These were the only ones to ripen during storage. All others required ripening after storage.

‡ Same storage life obtained in the following atmospheres :—
5 per cent., CO_2; 10 per cent. O_2.
5 per cent., CO_2; 5 per cent. O_2.
10 per cent., CO_2; 5 per cent. O_2.

With all other varieties, however, gas storage resulted in a decrease in storage life when compared with air storage. With the Grand Duke variety, the decrease was hardly significant. With the Wickson, Jefferson, Narrabeen, Golden Drop and President varieties, gas storage resulted in a very marked decrease in storage life. With the Narrabeen variety the decrease was as great as four weeks.

Summarizing the 1939 gas storage experiments with plums, it may be stated that gas storage may be slightly beneficial with a few varieties, but for most varieties it is definitely harmful and may cause serious injury. Hence, where mixed varieties are stored together, as during export, it is essential to prevent carbon dioxide from accumulating (due to respiration) in the storage chamber. This, of course, makes adequate ventilation necessary.

Results of gas storage experiments with plums prior to 1939 are set out in Table IV.

Several varieties have been stored in 2 per cent. CO_2, 5 per cent. CO_2 and 10 per cent. CO_2 and the storage life in these atmospheres and in air determined. The plums were stored at various storage temperatures. The results show that in practically all cases gas storage resulted in a decrease in storage life, thus supporting the 1939 results. The only exceptions were the Satsuma and Ballena varieties.

It is of interest to note that where a variety is adversely affected by gas storage, then even 2 per cent. CO_2 in the storage atmosphere may cause as much harm as a much larger concentration. Hence it is necessary to avoid the accumulation of even very small amounts of carbon dioxide gas in chambers holding plums.

Gas storage at 45°F. was carried out with the Golden Drop and President varieties in 1937 and with the King Billy variety in 1938. Controls stored in air at 45°F. all ripened satisfactorily, but storage in 5 per cent. CO_2 inhibited ripening of Golden Drop and President plums, while the King Billy ripened in 5 per cent. CO_2 but not in 10 per cent. CO_2. From Table IV. it will be seen that gas storage at 45°F. in no case increased storage life, and seriously reduced it in the President variety.

Summary.

Several varieties of plums were picked at two stages of maturity and were stored at 32°F. in air and in "gas" (5 per cent. and 10 per cent. carbon dioxide). They were subsequently ripened at both 45°F. and 60°F. and the storage life at 32°F. determined. This is the maximum storage period at 32°F. if normal ripening is to occur when the plums are transferred to the ripening temperature.

For local storage (ripening after storage proceeds at 60°F.) most varieties can be stored at 32°F. for six weeks, whereas for export (ripening after shipping proceeds at 45°F.) the limit at 32°F. for most varieties is four weeks. Allowing one week at 32°F. for precooling and awaiting shipment, the limit at 32°F. on board ship for most varieties is three weeks, after which the temperature should be raised to 45°F. Most varieties take about five weeks to ripen at 45°F. after storage at 32°F.

The various varieties differed enormously in their length of storage life. The Wickson variety stored at 32°F. and ripened at 45°F. had a storage life at 32°F. of only two weeks, and is, therefore, unsuited for export, while, at the other extreme, the Cole's Golden Gage variety, under the same conditions of storage and ripening, had a storage life at 32°F. of eight weeks.

It is shown that the export of the Satsuma and President varieties under the above conditions recommended for export, would be attended with a certain amount of risk.

For most varieties, gas storage definitely decreased the storage life and with some varieties even as little as 2 per cent. of carbon dioxide proved harmful. Gas storage slightly increased the storage life of the Cole's Golden Gage and Satsuma varieties.

References.

1. Tindale, G. B., Trout, S. A. and Huelin, F. E. —Journal of Agr. of Victoria, 1935, p. 552.
2. Tindale, G. B., Huelin, F. E. and Trout, S. A. —Journal of Agr. of Victoria, 1938, p. 609.

Young Farmers Broadcast

YOUNG Farmers from all States were represented recently when the 6th annual session for junior farmers was conducted by the Commonwealth Broadcasting Corporation Pty. Ltd. at the 2UW studio, Sydney. An address on the benefits of the junior farmer movement was given by the Minister for Agriculture in New South Wales (Major, the Hon. A. D. Reid, M.C., M.L.A.)

The three prize winners in an essay competition broadcast for a special prize, which was awarded to Hubert Mapleson, of Jindivic, Victoria. All young farmers are urged to strive for inclusion in these interstate teams, which do so much to further the interests of agriculture in the various States.

Young Farmers in the 2UW studio.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

THE rains which fell during April will enable autumn ploughing to commence, and growers will be taking the opportunity of providing surface drainage for excess rainfall during the winter. Attention to the underground drainage system may also be necessary, and an inspection of the outfalls of these drains should be made early this month to ensure that they are all functioning properly.

During the past season, many apple growers have been troubled by a brown spotting on the leaves, and where infection was severe some defoliation, particularly on Jonathan trees, has occurred. In the early stages of the infection small, dark spots occur on the leaves. These spots increase in size until they may be a quarter of an inch or more in diameter and either round or somewhat irregular in outline. The development of various shades of brown in the spot gives them a "target" or "frog-eye" effect. Frequently a small, dark, central area in the brown spot can be noticed, indicating the fruiting bodies of the fungus.

Specimens of foliage have been submitted to the biologist during this season, and he has reported that a fungus disease known as *Sphaeropsis Malorum* is present. This particular leaf-spotting condition is one of the stages of the fungus which causes black rot in apples and pears. Essentially it is a wound parasite, but, under favorable conditions, it may act as a true parasite and cause leaf infection. In some orchards, this parasite is affecting not only leaves but also limbs, and if cankers are observed on apple and pear trees the presence of this fungus can be suspected. Usually, these cankers are characterized by more or less concentric splits or cracks around the base of fruit spurs or buds.

The suggested treatment for the control of this fungus is the removal of the cankers, cutting at least 3 inches below the visible point of infection, and also the removal and destruction of mummied fruit lying on the ground or hanging on the trees. Particular care should be taken in ploughing under the fallen leaves, and the strips between the trees, which are missed by the implements, should be cultivated by hand in order to bury the leaves.

Unprotected wounds and polystictus infection on a crown grafted apple tree.

Additional treatment which would assist in the control is the use of a Bordeaux mixture 6.4.40 at the "green-tip" stage in spring as for black spot control. Spring ploughing should be completed early before the young leaves appear, or, if this is impossible, it should be delayed until the risk of infection is reduced considerably. This recommendation also applies to the control of black spot.

The black rot fungus may also attack fruit. It then causes small, circular, brown areas which rapidly increase in size. The fruit remains fairly firm and spongy, but it later develops a black colour and shrivels.

Recent observations of many apple orchards in this State have disclosed the necessity for growers to be able to distinguish between various troubles which attack their trees. Last year, drainage was a serious problem. On account of the continuous wet winter and early spring, many trees failed and others did not make vigorous growth during the early summer, and on some of these trees limbs died back. The best treatment for such trees is to remove

badly affected limbs and protect the cut surfaces with either white lead paint or Stockholm tar. This restores the balance between the top part of the tree and the affected and reduced root system. In addition to this treatment it is suggested that a rather heavier manurial programme should be employed to encourage the tree to make a new root system and new top growth.

The tendency among many Victorian orchardists to cut back any limbs which show weak growth, without first ascertaining the cause for this debilitation, should not be continued. In many cases an increase in the manurial application will have the desired effect, i.e., renewed vigour, and it would be a much better practice to maintain the size of the tree as much as possible and to encourage new vigour by manurial application, rather than to stimulate growth by heavy pruning. The latter system, although it may be effective for one year does not bring about a permanent improvement, and the trees may have to be pruned heavily again in a subsequent season, with a consequent further reduction in bearing area.

Rather promising results from the tree recovery aspect, in the treatment of trees affected by root borer, have been obtained by doubling and trebling the amount of fertilizer normally applied. It is not suggested that where a fungus disease, such as polystictus, is the cause of die-back, that the above fertilizer recommendation will overcome the trouble. In such a case the infected limb must be removed well below any visible signs of the disease and the wound protected by a suitable dressing. The prevalence of polystictus in many Victorian orchards requires the concentrated efforts of growers to prevent the spread of this insidious fungus. It is suggested that the more widespread use of wound dressings would reduce the incidence of this and other wood-rotting diseases.

The codling moth chemical bands around tree trunks should be removed and destroyed. An examination should be made of occasional bands to ascertain their effectiveness in destroying larvae and pupae of the codling moth. Other forms of orchard hygiene should also be attended to.

Shot-hole and scab of the apricot in the moister districts of the State can be effectively controlled by an application of Bordeaux mixture 6.4.40 during May, followed by a similar spray when the buds show "pink" in the spring. The importance of the May application of this spray is that it will generally protect buds from being killed by this fungus and will assist in the destruction of germinating spores in the bud scales in the spring.

Growers who are planting citrus trees should protect the trunks from sun-burn with several thicknesses of paper. These should be wrapped around the trunks and tied top and bottom. Before planting, bare-rooted trees should be thoroughly washed in water to remove the mud-puddle in which the nurserymen dip the trees to preserve the root system during transit.

Citrus packing charts for oranges in the dump case and in the citrus case (export), for grape-fruit in both of these cases, and for lemons in the dump case, are available free on application to the Director, Department of Agriculture, Melbourne, C.2.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

Now that the autumn annual plants have finished flowering, they should be removed and the ground prepared for the spring display. The ground should be deeply dug, and if necessary, given a good dressing of lime. If much stable manure has been used and the soil tends to be heavy, it will almost certainly require liming. If it is a light type of soil, it may not. A simple test is to place some blue and red litmus paper on the bottom of a small dish; cover with filter or blotting paper, and then place some of the soil in the dish, damping it so that the moisture will go through the filter paper to the litmus paper. If the red colour changes slightly towards blue, and the blue remains blue, no lime will be required. But should the blue change towards red and the red remain red, then the addition of lime is necessary to remove the acidity. If the soil is heavy, the addition of lime will tend to make it easier to work.

The dahlias have just about finished flowering, but if the area is not required for other plants, leave them in the ground until the frost nips them back. After the first frost, the tops should be cut off about three inches above ground level, but the tubers should be left for another two weeks—this enables them to ripen off before they are stored. The short stalks above the ground enable them to be lifted and stored more easily than if they were cut off at ground level. Store them in a very sheltered place, such as under a hedge or very shady trees. If stored in a shed, they get too dry, and tend to develop dry rot.

Make final plantings of Iceland poppy, calendula, viola, pansy, ranunculus, anemone, and carnation. Divide up and re-plant canna, agapanthus, alstroemeria, hyacinth, watsonia, lily-of-the-valley, and lilies.

This has not been a good year for autumn foliage plants, because the very hot weather in March scorched the leaves and a large number of them were dropped before they changed into their autumn tints. Some of these plants stood up to the hot weather better than others, and this gives one an opportunity of seeing which of them are most suitable for different districts.

The perennial herbaceous plants will die back after the early frosts. Although they may flower satisfactorily without interruption, it will be found advisable to lift them every second or third year. This gives an opportunity of dividing up the plants and re-planting the vigorous crowns. The continual dying back of these herbaceous plants ultimately sets up a certain amount of decay in the crown, and if not lifted the growth gradually deteriorates, and the blooms become small.

Roses should be carefully looked over to see if any should be replaced, and if so, order the varieties in plenty of time to save disappointments. Planting should take place during the months of June, July, and August.

Vegetables.

Although May is normally looked upon as a slack period in the vegetable garden, the April rains have been sufficient to enable the commencement of winter work. The summer vegetables have ceased developing, so after picking those that have ripened sufficiently, remove the vines of the cucumber, pumpkin and melon, and the tomato plants. If disease is noticed on any of these plants, it is advisable to burn them.

Any beds that are not being used should be dug up and left in the rough state—do not smooth them down, for in the rough state, the rain, air, and frost can enter more freely and help to sweeten the soil. If it is necessary, give a top-dressing of lime.

If the kitchen herbs require attention, lift them now; divide and re-plant the required amount. A border of these herbs around the vegetable beds is valuable not only in defining the area, but also in preventing the excessive run-off of water. The usual culinary herbs grown are mint, sage, marjoram, thyme, and parsley. Parsley is not a perennial, so a small quantity should be planted each spring and autumn. These herbs are very hardy and need very little attention when once established.

This year the cabbage moth has been very active, and the grubs are appearing on the cabbage, cauliflower, and Brussel sprouts. If not controlled, these grubs may spoil the crop; they feed on the leaves and as the plant develops, control measures are made more difficult. In the early stages, arsenate of lead, (spray or dust), may be used, but being poisonous to humans, it cannot be used after the plant commences to mature. One of the non-poisonous derris dust preparations may be used as a control measure in the later stage of development.

The earlier plantings of the cabbage family should be well established, so hilling should be carried out as soon as they have commenced to show definite signs of fresh growth. This assists them in withstanding the prevailing winds, and allows the excess winter rains to escape in the furrows between the rows.

Further plantings may be made of cabbage, cauliflower, silver beet, leeks, and the early varieties of garden peas.

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—June, 1940.

EROSION CONTROL

Holding the Soil on Cultivation Lands

By H. C. Forster, M.Agr.Sc., Ph.D.

A STUDY of the causes of soil erosion has shown that destruction and removal of the vegetative cover from the ground, in every case, have inevitably been the primary factors in initiating and promoting erosion. The obvious method of control, therefore, has been to restore that cover as quickly and as effectively as possible.

History has taught us, however, that man's evolution from the wandering nomad to the cultivated individual of present-day civilization has been largely linked with the development of land culture and arable farming. Cultivation of the soil in the past, therefore, has inevitably accompanied man's upward struggles. It is more than probable that unwise cultivation, which encouraged soil depletion and thus led to erosion, was responsible, at least in part, for the downfall of advanced civilizations of the past.

Present-day demands for *this* civilization's food supply still necessitate the production of large quantities of farm products such as wheat, oats, maize, vegetables and the like. Since these must be grown on cultivated land, it is inevitable that large areas of the world's surface must continue to be worked. That this may constitute a danger to this present civilization as it has to civilizations in the past is amply demonstrated by the numerous examples that may be seen to-day in America, China and Africa, where unwise cultivation has led to erosion and the ruin of the land.

If, then, the peoples of to-day wish to avoid the fate which has befallen previous races they must learn how to combat the danger of this erosion menace. Although we in Victoria may be more fortunate than many others in that our particular climatic conditions do not favour erosion, quite enough has occurred in the past, and is operating at the present time, to warrant a definite policy of prevention. Restoration of the vegetative cover is one method, but this cannot apply to large areas which must be cultivated for food supplies. What methods then can be employed for erosion control on these lands?

Although a number of new methods no doubt will be evolved for the control of erosion in the next decade, enough is known to enable us to indicate lines of attack which will definitely stay its ravages. These methods have been largely developed in the United States of America, where the problem has received much publicity, and much of the subsequent material of this article will come from that source. The main point is not a complete re-organization of our present agricultural methods in an endeavour to obtain an immediate complete restoration of our land, but rather the adoption of moderate amendments which will prevent further loss. New soil is in a continual process of formation, so that if we can but stay the soil-destructive forces (soil denudation), in course of time the soil will be rebuilt naturally.

Soil erosion may be classified into two types, wind and water erosion, each of which operates on cultivated land.

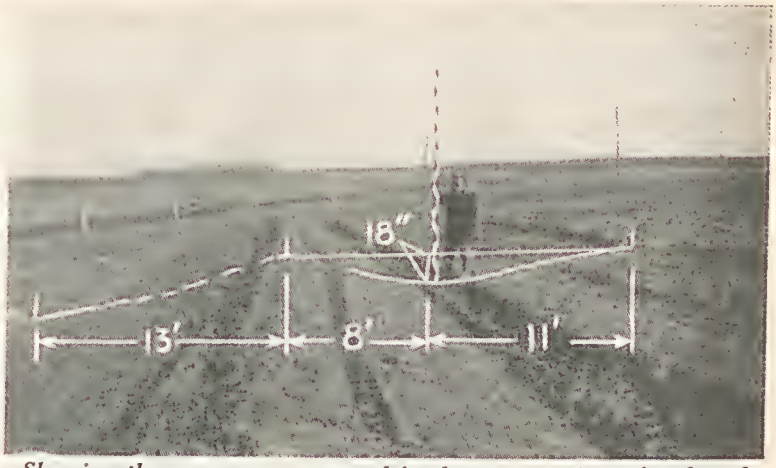
Severe surface erosion of the soil following heavy summer rains in the corn belt of the United States of America.

[Soil Conservation Service, U.S.D.A.

WIND EROSION.

The control of wind erosion has been dealt with fully in the May issue of this *Journal*. The methods of control may be summarized as follows:—

1. Spring cover crop.
2. Ploughless fallow (stubble and trash cover).
3. Cultivation leaving cloddy surface—
   (i) deep ploughing,
   (ii) late ploughing.
4. Cultivation leaving ridged surface—
   (i) furrowing,
   (ii) listering.



Showing the measurements used in the construction of a broad base terrace. [U.S.D.A.

WATER EROSION.

The principal factors which affect soil erosion are: 1. Geological origin of the soil. 2. Climate, including rainfall. 3. Physical topography. 4. Nature of the soil. 5. Nature and density of vegetation. The first two factors are not subject to adjustment; we must look, therefore, to the remaining ones for our methods of control.

Topography.

Considering the first of these, topography, it is well known that the slope of the land very materially affects both the volume and the velocity of the water travelling over it. With double the velocity, water will carry 64 times the load of soil. Any method which decreases the slope or retards the velocity of the water should therefore be effective in controlling erosion. As some one has said, "We should try to make the water crawl off our land, not run off."

Bench Terraces.

In countries with dense populations, it is often vital to cultivate as great an area as possible. In these circumstances it is necessary to work steep slopes that in other countries would be left to timber or pasture. Reduction of the severity of the slope is obtained by using "bench terraces" in which the land is graded into more or less level benches, the walls of which are protected with stones. This method was well known to previous civilizations, stone hedges estimated at 5,000 years old having been found in Ireland. Bench terraces may be seen in use to-day in the vineyards of the Rhine Valley and on the steep slopes in Italy, Japan, and Peru.

Broad Base Terraces.

On more gently sloping land, erosion may be controlled by the use of "broad base terraces." These are earthen structures formed with the help of a blade grader on the contour levels of the paddock. The soil for filling should be obtained from the upper side of the terrace only, thus forming a ditch which holds the water. The terraces should be broad on the base and shallow so that implements used in sowing and harvesting the crop can be operated without inconvenience.

The measurements recommended by the United States Soil Conservation Service are an overall horizontal width of base of 30 to 40 feet from the top of the cut slope to the edge of the fill on the lower side, the width of base of the actual terrace itself being about 15 to 20 feet, while the height above the bottom of the upper side ditch should not be greater than 18 inches. (In Australia it has been the custom to build narrower terraces than these.)

The distance between terraces will vary with the slope and erodibility of the soil, the average figures being given in the following table:—

Relation between Slope of Land and Distance Between Terraces.

Percentage slope (ft. per 100 ft.)	*Vertical drop between terraces.* Feet.	*Distance between terraces.* Feet.
1	2	200
2	2¾	140
4	3½	90
6	4	65
8	4¾	60
10	5½	55

[*Continued on page 296.*

Marginal Areas Grant

SPEAKING in the Legislative Assembly on 8th May, the Minister of Agriculture (Hon. E. J. Hogan), said that at a conference of Ministers of Agriculture and the Minister for Commerce, Mr. Cameron, at Canberra during the previous week, plans for the distribution of the £500,000 for assisting wheat growers in marginal areas were submitted from four States and debated and considered.

The applications of the four States compared with their allocations were:—New South Wales, £228,000 (£195,000); Victoria, £135,000 (nil); South Australia, £200,000 (£190,000); West Australia, £115,000 (£115,000).

"I agree with the protest of the member for Ouyen against the unfair treatment of Victoria by the Minister for Commerce, Mr. Cameron, in his distribution of £500,000 from the proceeds of the flour tax for the removal of wheat growers from marginal areas in New South Wales, South Australia, and West Australia, Mr. Hogan continued.

"At a conference of State Governments in Sydney on 26th August, 1938, which was attended by representatives of wheat growers from all States, it was unanimously agreed to ask the Commonwealth Government to pass legislation to provide a home consumption price of 5s. 2d. a bushel f.o.r. Williamstown or 4s. 8d. a bushel country stations for wheat used for human consumption in Australia. The Commonwealth Government agreed to the request. To enable this to be done during the period 1st December, 1938, to 30th November, 1939, £3,337,234 was raised by the flour tax in Australia of which Victoria contributed £964,546, and it is estimated that during the period 1st December, 1939, to 30th November, 1940, the flour tax will yield £1,250,000 and that Victoria will contribute £350,000.

"The Commonwealth Government included provisions in its legislation whereby disbursements from the fund could be made of £500,000 for drought relief in 1938-39 and for four years after that of £500,000 per annum for the removal of wheat growers from marginal areas, or for the relief of wheat growers suffering hardship.

"The Minister of Commerce, Mr. Cameron, has now decided to help the wheat growers on marginal areas in New South Wales, South Australia, and West Australia, and rejected Victoria's claim for £135,000 in respect of wheat growers in marginal areas in this State, and also refused to assist Victorian wheat growers who suffered severe losses from drought and rust last season.

"If, owing to the war, the price of wheat should continue to rise and the flour excise tax only realize £500,000 next year, and the distribution to New South Wales, South Australia, and West Australia of £500,000 for removal of wheat growers from marginal areas is continued, and nothing is allotted to Victoria, the whole of the proceeds of the flour excise tax will be expended removing farmers from marginal areas in New South Wales, South Australia, and West Australia, and none of it will be used to provide the home consumption price of 5s. 2d. a bushel f.o.r. Williamstown as originally asked for by the wheat growers' representatives and agreed to by the six State Governments and the Commonwealth Government in August, 1938.

"In that event, and if the basis of distribution announced by the Minister of Commerce is continued during the next four years, £2,000,000 collected as flour tax in Australia will be used for the removal of wheat growers from marginal lands in New South Wales, South Australia, and West Australia, while Victorian wheat growers would receive no assistance from the flour tax.

"It is a most inequitable decision and cannot be justified by the Commonwealth nor accepted by the Victorian Government.

"This Parliament, and all the Victorian members in the Commonwealth Parliament should protest to the Prime Minister against Mr. Cameron's unfair allocation of the £500,000 from the proceeds of the flour excise tax."

Irrigated Summer Crops at Boort

Report on the 1939-40 Competitions

By A. Morgan, B.Agr.Sc., Irrigation Field Officer

FROM the middle of December, to the end of March, unless the autumn "break" comes early, the irrigation districts where properties of 300 acres or more are the rule, do not present an "irrigation appearance" to travellers along the main roads. In the closer settlement districts the frequent occurrence of paddocks of lucerne, paspalum and clover, or permanent pastures fronting the highways keeps the visitor fully conscious of the fact that the waters from the Murray or the Goulburn rivers are continuously flowing through man-made channels over a huge acreage in northern districts. That there is no conspicuous evidence of the use of irrigation water in the Boort district, apart from the wheel-meters and culverts over channels, should not be taken to indicate that land owners in this area are not fully alive to the possibilities afforded by the cultivation of permanent crops under irrigation.

Mr. R. H. Webb's winning lucerne entry.

Where the sowing of these permanent paddocks is being undertaken it is being done in the proper manner (by which grading and layout under the border system are inferred) and the rate of progress under this system is necessarily restricted by considerations of time and labour. In most cases a careful selection of soil is made and such a paddock may well be hidden from the view of the passer-by.

For reasons connected with the frequency with which water is available through the channels, and about which further reference will be made in a later paragraph, the permanent sowings have been mainly restricted to lucerne for summer feed and the subterranean clover—Wimmera rye-grass mixture for autumn to spring grazing, but a fair proportion of the improved acreage carries perennial rye-grass in addition. In the report on the subterranean clover and rye-grass competition (this Journal, December, 1939) attention was drawn to a type of perennial rye-grass which has developed on Mr. J. D. Fyfe's property under conditions generally regarded as suitable only for Wimmera rye, and should this type spread through the district it will prove a great boon. Lucerne, grown alone, is not ideally suited to grazing, and in the case of the winter pasture the perennial rye-grass will prove more stable in association with the subterranean clover.

In spite of the disability imposed on lucerne stands by grazing, in contrast to cutting them for hay, the plant has demonstrated its value at Boort, and paddocks inspected some years ago are heavy producers. Those who waver between the sowing of annual summer crops, and the establishment of lucerne on land graded and banked for the proper control of irrigation water, need have no fears that it will fail before it repays many times the cost of laying it down.

The Awards.

The prize-winning entry in the 1939-40 lucerne competition conducted by the Boort Agricultural and Pastoral Society was exhibited by Mr. R. H. Webb. It was selected from a paddock which represents Mr. Webb's first venture in lucerne growing, but his success by no means could be regarded as "beginner's luck."

A buckboard which is carried on an old three-wheeled stripper frame.

In the first place the selection of the soil, which is typical of the lower land, shows that he has been aware of the fertility requirements of the plant. Poor, high ground could not be expected to give comparable results. The paddock has a good fall, indicating an appreciation of the value of good drainage for lucerne. That he places considerable value on the proper control of irrigation water supplied to it is demonstrated by the preparation of the ground. It has been graded, and banked on the border system with check-banks approximately 40 feet apart. In the opinion of the writer, the narrow bay, even only 33 feet wide, offers numerous advantages in water control, and in many cases it compensates for lack of technique in grading.

While the theory of grading is generally recognized, to put it into effect is often beyond the ability of the operator, sometimes because of lack of practice, at other times because of faulty judgment, and frequently because the implements successfully used in preliminary grading are not suitable in design for the finer work involved in finishing off the job, except in very expert hands. The matter of grading is so important to the culture of lucerne, which is subject to "drowning" and "scalding" where levelling is indifferent, that one feels impelled to discuss the implements employed.

For the rougher work—taking off shoulders, filling large depressions and crabholes—the buckboard and buckscraper have the merit that they are easily manoeuvrable with a team of horses or a tractor, and will shift a great deal of soil. The work is arduous when the operator is on foot, and some irrigators attach a type of sled as a platform to work from. A further development is the buckboard carried on a three-wheeled or four-wheeled frame, usually improvised from an old stripper, as shown in the photograph. This has two disadvantages for finishing off—it has a short wheel-base, and the operator is sitting too high up to see his work in relation to the terrain. A low grader with a long wheel-base gives best results for finishing. The various implements used in grading land were discussed and illustrated in the April issue of this Journal.

The length of the bays at Mr. Webb's is about 12 chains, and for the fall this was suitable. Long runs are to be avoided wherever possible, as it is obvious that over-watering at the head of each bay is likely with them. This is more prevalent in porous soils, and in such cases the length of the bays should be correspondingly reduced. For average conditions, bays of 10 chains length are preferable. Further control of the water was provided by channel structures—concrete stops with board drops—and by 6-in. pipes as outlets from the head-ditch.

When sowing the lucerne, Mr. Webb used oats as a cover crop. This is a common practice with first ventures with lucerne, but it is one which should be discouraged. Any competing plants such as weeds should be eliminated as far as possible by fallowing, and in fact with lucerne it is legitimate to regard oats or barley sown with the lucerne as akin to weeds in their competitive effect. In most cases the success of the lucerne becomes dependent on the extent to which the cereal is fed off, unless the rate of seeding of the cover crop is well below that used for hay or grain. A further complication is also likely to arise if it is decided to cut the cereal for hay, in which case it is frequently found that the lucerne is not watered according to its requirements. Some lucerne stands sown with cereals have been seen in early summer to be no further advanced than if they had been spring-sown. From these considerations it is clear that good working of the ground, conservation of moisture, and elimination of weeds provide the conditions under which the lucerne can be sown by itself at about 10 lb. per acre, and this system will be found the most useful and reliable.

As commonly found with young stands on recently graded ground, patchiness in regard to height of the lucerne was noted at the first inspection at Mr. Webb's, and it is likely that this had been accentuated by the very sparing use of superphosphate at sowing time. This deficiency was remedied by a top-dressing with

three bags per acre, given before the second inspection in February. The Department's experience in the north, with manurial tests for lucerne, shows conclusively that anything less than 4 cwt. per acre does not give the maximum profit from manuring, while at Swan Hill, on the Murraydale flats, 6 cwt. per acre was the most profitable application. Regular top-dressing has been found efficacious in eliminating a great deal of the patchiness which occurs in lucerne and pastures (apart from patches caused by selective grazing.)

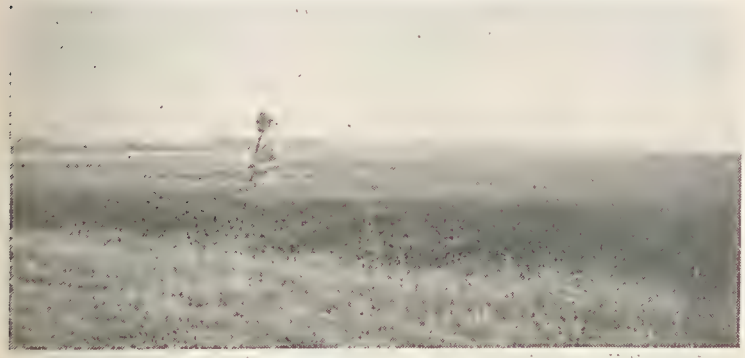
While referring to this feature it is interesting to note that sheep grazing on an adjacent section of Mr. Webb's lucerne showed a decided preference for the short patches (see photograph). Continuation of this will prove detrimental to the stand, and the avoidance of the grazing out of the less fertile places can be secured either by arranging for more subdivisional fencing or by putting on more sheep for shorter periods at each grazing. The former, by giving better control over a wider range of circumstances, is to be preferred. Lucerne suffers from poor grazing methods, and this aspect is as worthy of attention as watering and manuring.

Showing the selective grazing by sheep of short patches of lucerne on Mr. Webb's property.

The condition of the prize-winning stand showed an improvement at the second inspection on 22nd February, 1940, as compared with that evident at the first inspection on 12th October, 1939, and a glance at the table of points will show that this was a feature common to most of the exhibits. This was due to the fact that water was being withheld, in the spring, because the feed was not required. The rainfall had been particularly suitable to the growth of annuals, and as an unfortunate corollary to the abundance of feed, sheep were bringing high prices, making it difficult for the grazier to foresee a reasonable profit if he bought to stock his property.

Second place went to Mr. J. D. Fyfe. Mr. Fyfe's great care in grading, and the use of narrow bays, have enabled him to maintain pastures and lucerne in splendid condition as regards weed-growth, drowning-out, &c., in spite of the excessively long runs of water which he employs. In the case of his lucerne exhibit the bays were over 30 chains long, but, as can be judged from the photograph, it was difficult to fault the stand so far as uniformity, yield, and freedom from weeds were concerned. By attending personally to the watering, Mr. Fyfe has also protected his lucerne from many of the troubles which result from the careless use of water.

Points were lost for condition at both inspections. In the spring, the paddock was allowed to go to the seeding stage, which fodder analyses show is not the optimum stage for hay quality. Early blooming stage is the best for hay, giving yield, leafiness, and feeding value in the best combination. The stand had been allowed to set seed previously, and the favorable rains resulted in a good strike of new plants, which were well-grown by the middle of October. It is debatable whether these plants will survive as long as those still left from the originial sowing, but they must serve a very useful purpose in excluding weeds



Mr. J. D. Fyfe's high yielding, uniform lucerne stand which gained second place.

and annual grasses in addition to making their contribution to the production from the paddock.

The population of plants in a lucerne paddock usually settles down to a density which reflects the conditions of soil and management. For example, the number of plants per square yard on a "no irrigation" bay of lucerne at the Werribee Research Farm was far greater at the end of six years than on the bay receiving "six waterings of 4 inches," sown at the same time and under identical conditions in regard to preparation, rate of seeding, &c. The productivity of the irrigated bay was several times greater than the other; this leads to the conclusion that a strong plant develops at the expense of weaker neighbouring plants, and the new plants growing in Mr. Fyfe's lucerne may be expected to have to put up a fight to survive in competition with the old plants which have appropriated the root-room commensurate with their productivity.

A high yielding, first season stand of lucerne entered by Mr. H. L. Smith.

At the second inspection the paddock was being cut for hay, and the mower, sweep, and press were in action. Altogether, there is 350 acres of lucerne on East Boort Estate, and some of the paddocks are carrying the fine strain of perennial rye-grass mentioned previously.

Finally, a few remarks regarding the particular value of lucerne to irrigators in the Boort district will be relevant. For present conditions of water supply it is the logical complement to the Wimmera rye-grass and subterranean clover paddocks. In comparison with lucerne, for productivity, palatability, length of life, response to topdressing, resistance to dryness, and many other points of value to the grazier, the various summer fodders such as millet, Sudan grass, ambercane, &c., make a poor showing. These annuals are best used as preliminary, not staple, crops, mainly because they can be successfully grown before the land has been properly prepared for permanent sowings. It is disappointing to see them put in year after year, with no attempt to bring the ground up to the conditions of layout which will give the best returns for the water used. The development of salted patches, noted in one paddock of summer fodder, shows that the evils which attended the uninformed use of water in other districts are possibilities in some areas in the Boort district. Severe lessons have been learned as a result of the continued use of methods of wild flooding, and there is every reason for the modern irrigator to take warning from them.

TABLE I.—BOORT LUCERNE COMPETITION, 1939–40.

Exhibit.	Layout Channel &c.	Condition.	Uniformity.	Freedom from Weeds.	Apparent Yield.	Totals.	Grand Total.
Maximum points	20	20	20	20	20	100	200
R. H. Webb	19	19	18	18	18	92	184
J. D. Fyfe	19	19½	17½	19	17	92	
L. Weaver (1)	18½	15	19½	19½	18	90½	182½
G. Frost	18	16	19	19½	19½	92	
L. Weaver (2)	19	15	18	18	17	87	178
H. L. Smith	19½	19	18	19½	15	91	
	19	19	17½	14	15	84½	171½
	19	16	18	19	15	87	
	19½	14	18	18	15	84½	171½
	19½	18	18	19½	12	87	
	17	16	16	12	13	74	164½
	17½	19½	17½	19	17	90½	

Summer Fodders.

Four exhibits were entered in the section for summer fodders. The foregoing remarks in respect of the uses of summer annuals were inspired by the absence of layout for irrigation on the winning paddocks, and they should be applied equally to this section as to the lucerne competition. First place was secured by Mr. C. Kirk's section of a paddock of Sudan grass sown in November with 17 lb. of seed and 45 lb of superphosphate per acre. It is pleasing

to record the use of manure with the crop, as in other districts the summer fodders are frequently sown without manure; this involves a drain on fertility as well as adverse effects produced by the uncontrolled use of irrigation water. Up to the judging on 22nd February, three waterings had been given, the last prior to judging, and the crop was fresh in appearance. It was as even as could be expected on ungraded ground, well headed, and of fair density. The scarcity of weeds in the paddock was a feature on which Mr. Kirk should be complimented.

TABLE II.—BOORT SUMMER FODDERS COMPETITION, 1940.

Exhibit.	Condition.	Uniformity.	Freedom from Weeds.	Yield.	Total.
Maximum points.	20	20	20	20	100
C. Kirk (Sudan grass)	19	17	19	19	74
H. Barnes (Jap. Millet)	18	16	19½	18½	72
L. J. Sutton ..	17	17	19½	11	64½
W. R. Slatter	8	13	18	5	44

Second place went to Mr. H. Barnes for a section of his paddock of millet, sown in early November with 14 lb. of seed and 80 lb of super. per acre. It had been watered three times—in November, first week in January, and mid-February—and allowing for lack of grading it was an attractive exhibit from the standpoints of appearance and yield. The weed content was also low.

Crop of sudan grass grown by Mr. C. Kirk.

A program of improvement which might be followed with summer fodder crops is to carry out a rough grading and fill the worst depressions. Another year, oats can be grown after a further grading and the provision of a limited number of banks to control the water. Later, grading should be completed and banks up to 45 feet apart put up in preparation for the sowing of either subterranean clover or lucerne. This extended program of grading ensures that any sinking of the soil on the sites of old depressions will be completed before a permanent seeding is gone on with. In addition, the liberal manuring of crops grown during the preparatory period will put the land in good heart.

An attractive crop of millet entered by Mr. H. Barnes.

Tree Windbreaks on the Farm

By K. V. M. Ferguson, M.A., B.Sc., Forests Commission of Victoria

LANDHOLDERS in Victoria are becoming more conscious of the value of trees for affording shade and shelter to stock, crops and buildings. Windbreaks are an asset on any farm, especially on flat, exposed plain country such as characterizes the western and northern districts of this State and also in the wet and cold central districts of Victoria.

Live stock, whether it be sheep, lambs, cattle or horses, benefit by protection from wind both in summer and winter. On a hot summer day, animals seek the shade of trees for protection from the blazing sun, and on a bleak winter's day it is common to see cattle and other farm animals huddled together for warmth where there is no shelter from the wind. The farmer who provides for the comfort of his stock is amply rewarded by healthy, well-conditioned animals, by increased breeding percentages, and by decreased losses through exposure, especially in the lambing and shearing seasons in the case of sheep.

A windbreak of pines gives welcome protection to sheep in this paddock on the plains of the Werribee district.

As far as possible, a windbreak should be located at right angles to the prevailing wind direction. A belt in the shape of an L gives protection from wind from any quarter.

In selecting species for shelter planting, it should be kept in mind that the trees should be wind-firm, evergreen, suitable for the soil and climatic conditions of the locality, and preferably of a low-branching habit, particularly if they are to be grown in a single or double row. Trees should be planted in two or three rows, or in the form of a small plantation. A three-row windbreak is very effective, the trees of the two outer rows alternating with those in the centre. The distance between rows will depend on the habit of growth of the species.

An effective windbreak of Sugar Gum in the Western District. The low, bushy shelter is provided by coppice regrowth from the stumps of trees felled for fuel.

In Victoria, a wider range of species is available for planting in the moist, cool localities than in warm, dry, inland districts. Some of the most reliable which could be used as the basis of a farm tree-planting scheme are the following.

The various cypresses are ideal shelter trees which thrive in all parts of the State except in the warm northern and north-western districts. They are characterized by a dense, leafy crown and spreading branches persisting almost to ground level. The Monterey cypress (*Cupressus macrocarpa*), planted 15–20 feet apart, provides excellent shelter, as also does Lambert's cypress (*C. Lambertiana*) at an espacement of 20–30 feet. Arizona cypress (*C. arizonica*) is somewhat more resistant to dry conditions than the others.

The insignis pine (*Pinus radiata*) thrives best in cool hill or lowland districts where the

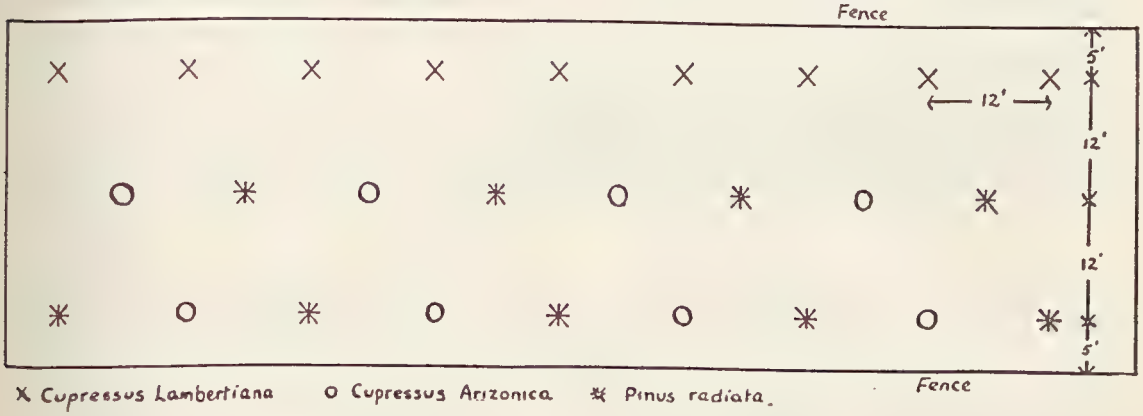
rainfall exceeds 25 inches per annum. In coastal soils, maritime pine (*Pinus pinaster*) is to be preferred. Mahogany gum (*Eucalyptus botryoides*) is one of the best broad-leaved species for planting on moist lowland soils.

In the warmer and drier inland districts of the Mallee, Wimmera, and northern and western plains, sugar gum (*E. cladocalyx*) is one of the most reliable shelter trees. A dwarf variety, with low-branching habit, is now cultivated, and a triple windbreak comprising a centre row of the tall-type tree with a row of the bushy variety on either side provides very effective shelter. In the very dry and very warm inland localities, where drought is likely to be experienced and water is scarce, the pepper tree (*Schinus molle*) is invaluable.

The majority of young plants may be either eaten by stock or so knocked about if they are not protected by fences that they eventually die. To avoid this, the young trees must be protected, preferably by means of a stock-proof fence.

A bleak outlook for stock in both summer and winter. The sheep are lying exhausted from lack of shade and water.

A suitable layout for a windbreak in districts with a rainfall of 25 inches or more is shown in the accompanying diagram.



Phylloxera Resistant Vines

Application for the supply of grafted phylloxera resistant rootlings from the State Vine Nursery, Wahgunyah, for delivery after June, 1941, should be lodged with the Manager, Viticultural Station, Rutherglen, before 15th June, 1940. All grafted rootlings for disposal this season are covered by orders, but a reasonable number of ungrafted resistant rootlings are available for immediate distribution. Prices and conditions governing the distribution of phylloxera resistant vine rootlings and cuttings may also be obtained from the Manager.

Saving Tomato Seed

Disinfection of Seed

By B. P. Krone, Fruit Packing Instructor

A GOOD plan when saving tomato seed is to mark plants which show good cropping habits, good shape and quality fruit, and freedom from disease, and allow the fruit to ripen thoroughly before harvesting. In a badly diseased field, an occasional healthy plant with tomatoes of good quality is rare, but if noticed, always save the seed, because it is possible that this may prove a good and disease-resisting variety. This is preferable to selecting just the nicely-shaped tomato as is frequently done, because some of those nicely-shaped tomatoes may not inherit other desirable characteristics. It should be pointed out that a flat-round variety frequently becomes more oval late in the season, and an oval variety sometimes elongates, therefore this feature is misleading.

The selected tomatoes should be cut in half, and the pulp squeezed into a vessel and allowed to ferment, which will require two or three days, according to the atmospheric conditions. When fermentation commences, the good seed will sink to the bottom and the rubbish is easily poured off. To do this, fresh water should be added (but not until the pulp has fermented); the contents thoroughly stirred, and the residue poured off. Several washings will produce nice clean seed, which should then be disinfected by soaking it for approximately five minutes in a 1 in 3,000 solution of bi-chloride of mercury and finally rinsing it in fresh water many times. The seed is then spread on calico, or other clean material, to dry quickly. Frequent raking during the drying process will prevent lumps of seeds. Do not attempt to dry tomato seed on rough or fibrous hessian, as the fine particles in the material my severely mat the seed together and spoil the sample.

When large quantities of seed are required, and the tomatoes are fermented in a barrel, make sure the whole contents are thoroughly squashed and stirred occasionally, in order that fermentation will be uniform.

The easiest method of using bi-chloride of mercury is to procure it in tabloid form from a chemist, and dissolve one tabloid in three pints of warm water. The *solution is extremely poisonous,* so care must be taken. The solution will quickly attack a metal vessel, therefore china or glassware should be used. Do not make the solution stronger than 1 in 3,000. Tests have shown that germination has been delayed for periods up to ten days with some varieties, when a strength of 1 in 1,000 was used. Another good treatment is to soak the seed for about one hour in a bluestone solution of ½ oz. of bluestone to 1 quart of water.

Tomato seeds are very viable, and will germinate even after years of storage. It is not a good practice to keep them too long, because the seed coat becomes hardened, and the germination period may be delayed for several days.

The average number of tomato seeds per ounce may be of interest. Actual counts revealed the following:—

Burwood Wonder	10,120
City of Parramatta	12,000
Crimson Bell	9,810
Coronation	10,530
Eccles Surprise	10,700
Kondine Red	10,840
Market King	11,340
Potentate	11,520
Pritchard	10,025
Prosperity	9,360
Recruit	9,000
Red Marhio	10,000
Rouge de Marmande	11,000
Rutgers	11,050

For practical purposes, growers should provide 1 oz., or slightly more, per acre. This amount of seed would make provision for non-viable seed and also for plants which are not suitable for transplanting.

Irrigated Pasture and Lucerne Competition

Results at Maffra

Report of the Judge : E. T. Beruldsen, B.Sc. (Agric.), Senior Irrigation Officer

IT would be difficult to find better conditions for the establishment of pastures than those which obtain in the irrigation areas around Maffra. Nature has been beneficent in the matter of soil and climate and, with the aid of a most reliable storage of water for irrigation purposes, little difficulty has been encountered in maintaining high production from both pastures and lucerne. Despite these natural advantages, progress in the use of the most efficient methods of watering and manuring has been relatively slow in this district compared with that accomplished in many instances in the northern irrigation areas of Victoria where conditions of soil, &c., cannot be considered to be so favorable.

Ewes and lambs on irrigated pasture on the property of Messrs. A. G. and B. Clyne, Tinamba.

In justice to the irrigation farmers in the Maffra district, it must be admitted that there has been a growing realization that the fullest advantage has not been taken of the means at their disposal, and there has been an increasing demand for research work to be conducted locally in an endeavour to solve some of the problems peculiar to the district. In 1939 the Department of Agriculture found it possible to commence a very comprehensive series of pasture experiments in the district, and plots have been established on the property of Mr. R. Rautman, at Tinamba.

The plots, being easily accessible, have engendered tremendous interest, and already have been responsible for a distinct fillip to top-dressing in the district. While not so many years ago it was the general opinion that the soils, especially around Newry, were so rich that the use of fertilizer for pasture was scarcely necessary, that opinion has now been reversed, and the question now arising is how much fertilizer to apply.

In this district "fertilizer" is synonymous with "superphosphate," and the evidence accumulated on the experimental plots during the last twelve months does not indicate that any other manure is necessary at present, but that applications of up to 4 cwt. of superphosphate per acre are amply justified. The experiments have indicated also that the fullest advantage of the heavier applications of superphosphate can be obtained only when the pasture is irrigated more regularly and frequently than is the general practice in the district.

Some bays have been irrigated nine times during the past season, as compared with a maximum number of four irrigations throughout the district. There is no evidence of waterlogging on these frequently watered bays. On the contrary, the profuse growth of mixed pasture on these adequately manured and adequately watered plots has been able to make full use of the applied water. It has been

5835/40.—3

proved beyond doubt that from adequately manured pasture the best results are obtained only when rainfall plus irrigation reaches a total of 44 to 48 inches. At the State Research Farm, Werribee, this entails the application of at least 2 acre-feet of water in the course of one season to each acre of pasture or lucerne. For best results during most seasons somewhere near this amount should also be used in the Maffra district. Of course, one realizes that certain types of soil in the district could absorb this amount in three waterings, but modifications of the layout for irrigation, such as shorter bays, can effect and have effected much greater economy in the use of water. Indeed, waterings in excess of 4 inches are definitely wasteful, especially for pastures, and losses through deep percolation should be avoided if at all possible.

When there are long intervals between irrigations on fairly porous soils, it is obvious that it would be extremely difficult to keep the quantity of water used at an irrigation within reasonable limits. The adoption of a method of more frequent watering, using an adequate head of water, will considerably reduce the amount of water absorbed at each irrigation.

During the course of judging the Maffra competitions for pasture and lucerne, opportunities were available for observing the various layouts and methods adopted by many of the irrigators. Although the general efficiency of the irrigators was most evident, in not a few cases it was noted that supply ditches or channels were quite inadequate to cope with a reasonable stream of water. It is not desired to advocate the construction of large channels which would entail a large waste of valuable ground, and which would be difficult to keep in order, but channels moderately large would avoid irrigation with a small stream, and consequently reduce losses through deep percolation.

In common with other districts, it was found that many farmers around Maffra understood the true significance and importance of proper grazing methods. Very varied methods exist, many of them sound, and most embodying the fundamental principles of rotational grazing. However, many farmers grazed the pastures too hard and too frequently, with the result that considerable digestive trouble was experienced with stock, and coincidentally the pastures became dominantly populated with prostrate plants such as white clover or flat weeds of various kinds.

Complaints about bloat in the dairy cattle are very prevalent, and in most cases the complaint is attributed to the superabundance of clover in the pastures. The adoption of a proper rest period of from three to four weeks between grazings will assure a proper balance of the grass and clover constituents in the pasture, and at the same time make certain that there is a good balance of the fodder constituents, especially in regard to protein and fibre.

A survey of the district has shown that bloat is most prevalent where the pastures are not rested for the proper period. There have been many instances where, in an endeavour to minimize bloat, the pasture has been rested for a month or even longer, and then the cattle have been kept on the pasture subsequently for about a fortnight. During the second week of the grazing period the incidence of bloat has again arisen. Probably this is correlated with the fact that after the cows have picked over the feed in the paddock for about a week they tend to concentrate on those patches of pasture which have been grazed only a few days previously. In the spring particularly, these patches would provide abundance of short succulent fodder which is far too rich in protein and much too low in fibre for normal requirements of the animals.

Such cases have been noted where usually there is insufficient subdivision on the farm. The effect of a good grazing system, combined with liberal top-dressing, has been most marked on the farm of Mr. K. Stockel, at Nuntin. Two and a half years ago Mr. Stockel used to graze each of his pasture paddocks about every nine or ten days. He was alarmed at the gradual dominance of white clover in the pastures, particularly as he was having considerable trouble with bloat.

Although an advocate of top-dressing with superphosphate, he was considering the withholding of this manure for a period in order to discourage the spread of the clover and bring back the grasses. However, acting on the advice of the Senior Agrostologist of the Department, Mr. L. C. Bartels, he gradually widened his rotation period out to at least three weeks, and at the same time gradually more than doubled his annual dressings of superphosphate, until at present he is using over 3 cwt. per acre. During the past two seasons Mr. Stockel has had little or no trouble with bloat, and his pastures have attained a very

desirable balance of grass and clover and are more vigorous in their growth. In his own words—"After milking, the cows are grazing for only a few minutes when they begin to lie down, since the feed is more easily available."

This experience corroborates the evidence gained from experiments at the State Research Farm, Werribee, where pasture plots received similar treatment with regard to manure and irrigation, but were mowed at varying intervals. It was found that within limits the longer the interval between cuts the higher was the production. Pasture harvested at intervals of four to five weeks gave high yields combined with high quality as represented by the botanical and chemical composition.

Top-dressing the winning pasture, entered by Mr. K. Stockel, Nuntin, with 4 cwt. superphosphate per acre.

A few good pastures at Maffra had deteriorated and become excessively weedy through having been cut for hay two or more years in succession. Hay-cutting should be carried out on different paddocks in rotation. Regarding pasture hay, it is better to sacrifice some yield by cutting at a fairly early stage. Not only is the resultant hay of good quality, but the aftermath will make fresh growth and the pasture sward will not lose its original density.

Some of the older pasture swards were excessively weedy, partly on account of the remarkable fertility which had accumulated over a period of years. The weeds appeared to have reached a stage beyond which they could be completely controlled by mechanical means, and, owing to the accumulation of organic matter, the pasture sward had assumed a spongy condition. With such paddocks, it might be good policy to cash in on this accumulated fertility by breaking the pasture up and growing a crop of beet or maize. Succeeding this crop, the paddock could be remodelled for irrigation and a fresh pasture laid down. In the Werribee district very high rentals are paid by market gardeners for land which has been under pasture for a good number of years. Those concerned realize fully the value of the fertility which has accumulated through consistent top-dressing with superphosphate in conjunction with the depasturing of dairy cattle.

The Awards.

This inaugural irrigated pasture and lucerne competition of the Maffra Agricultural Society has been distinguished by a record number of entries for competitions of this nature, viz., 22 entries in the pasture section and nine in the lucerne section. This fact testifies to the keen interest taken by farmers in the district in the application of good methods. Arrangements for judging were carried out smoothly and expeditiously.

In perusing the details of the awards, competitors will note that by allotting a proportion of the total points to each important feature a very equitable scheme of judging has been evolved, which gives entries on inferior classes of land as good a chance as those on the better classes of land.

In the pasture section, Mr. K. Stockel, of Nuntin, gained first place with a paddock of 5½ acres, which was sown down to pasture in the autumn of 1935, after having been cropped with beet and cereals for some years. The mixture sown per acre was—perennial ryegrass, 20 lb.; cocksfoot, 8 lb.; certified New Zealand white clover ½ lb.; strawberry clover, ½ lb.; and subterranean clover, 1 lb. per acre. One hundredweight of superphosphate per acre was used at seeding, and this dressing was repeated in two consecutive years. In 1938 the dressing was increased to 1½ cwt. per acre, and in 1939 two bags per acre were applied. This autumn a further two bags per acre have been applied.

The paddock is well graded in 30-ft. wide bays, the channel was clean at both inspections, and good provision for drainage exists. At the spring inspection, the growth was at an ideal stage for grazing, and presented a well-balanced mixture of the grass and clover species. Subterranean clover was present in only small proportions. There were practically no weeds except near the checkbanks, where there was a

little cape weed and flat weed (*Hypochoeris* spp.). During this season the pasture was watered four times. At the second inspection conditions were slightly dry, and in consequence the condition of the pasture had deteriorated slightly from a show stand-point. Neglected tufts of grass had been clipped off with the mower, and fresh growth was coming away in these patches. The very high production attained from this pasture is evident when it is considered that it is grazed by 70 milking cows from one to one and a half days every three weeks.

Second place was awarded to Mr. L. Donahoe, of Boisdale, for an exhibit of 6 acres of pasture sown down seven years ago, i.e., two years before Mr. Donahoe came on to the property. The paddock was well graded in ½-chain wide

BEST 3 ACRES OF PERENNIAL PASTURE, MAFFRA.
(Two Inspections.)

Exhibitor.	Layout for Irrigation and Condition of Channels.	Condition of Pasture.	Uniformity.	Mixture.	Freedom from Weeds.	Total.	Grand Total.
	20	20	20	20	20	100	200
K. Stockel	18	19	19	20	19	95	
	18	17	18	20	19	92	187
L. Donahoe	18	19	18	20	18	93	
	18	17	17	20	17	89	182
Whittakers and Co. and Onley	18	19	19	19	18	93	
	18	17	17	18	17	87	180
A. G. and B. Clyne ..	18	19	18	18	18	91	
	18	18	17	19	16	88	179
A. Fixter	17	17	17	20	18	89	
	17	19	17	20	17	90	179
J. E. Creighton ..	19	17	17	19	17	89	
	19	17	17	19	17	89	178
C. R. Daniel ..	17	17	17	19	18	88	
	17	18	17	19	18	89	177
E. J. Pearce	17	16	18	18	19	88	
	18	16	18	18	18	88	176
T. M. Noble	17	17	19	17	16	86	
	18	19	19	18	16	90	176
C. Tucker	15	19	17	19	18	88	
	15	19	17	19	17	87	175
A. G. and B. Clyne ..	17	16	18	17	18	86	
	17	17	18	17	19	88	174
S. Saligari	20	16	18	16	16	86	
	20	16	18	17	17	88	174
R. Rautman	17	18	16	18	17	86	
	18	17	16	19	17	87	173
D. R. Manson ..	17	17	17	19	16	86	
	18	18	16	19	16	87	173
L. H. Semmens ..	17	16	18	18	17	86	
	18	17	18	18	15	86	172
R. G. D. Singleton ..	18	15	18	16	16	83	
	18	18	18	17	18	89	172
J. T. G. Johnson ..	17	17	17	17	18	86	
	17	17	17	18	17	86	172
S. Purdy	15	17	18	17	18	85	
	15	18	18	17	19	87	172
N. A. Marks	17	16	16	17	15	81	
	18	17	18	18	17	88	169
G. Wyeth	17	16	16	17	15	81	
	18	18	16	18	15	85	166
Wisely Bros.	16	16	15	17	16	80	
	17	18	16	17	16	84	164
F. W. Benson ..	17	15	15	16	15	78	
	17.	19	16	16	17	85	163

bays, and the channel was adequate in size and free from weed growth. There was a good natural drainage. The sward was a dense mat of perennial rye-grass, cocksfoot, wild white clover, and prairie grass. There were a few weeds, but these were not so abundant as might have been expected on a pasture of this age. At the autumn inspection this pasture also showed signs of dryness. Mr. Donahoe now uses 4 cwt. of superphosphate per acre on both his pasture and lucerne.

On the property of 40 acres there are 16½ acres of pasture and 5 acres of lucerne. These maintain 18 to 25 cows. Milk returns from this area last year were £460.

The pasture exhibited by Whittakers and Co. and Onley, of Newry, was sown in March, 1938, with 20 lb. Clunes perennial rye-grass, 6 lb. cocksfoot, 2 lb. certified New Zealand wild white clover, and 1 lb. lucerne, together with one bag of superphosphate per acre. One bag of superphosphate per acre has been applied each year since. Irrigation is carried out every four weeks. The grading has been well done, the bays being three per chain next the supply

A high producing member of Messrs. A. G. and B. Clyne's Jersey herd at Newry, grazing on irrigated pasture.

channel and spreading out fanwise towards the drainage channel. Intermediate checkbanks on the lower slopes were placed where necessary. This pasture consisted of a well-balanced mixture and presented a very attractive appearance in the spring. Like others, it showed signs of dryness at the autumn inspection. Eighty cows are depastured on this paddock during the day for ten days to a fortnight, after which the pasture is spelled for two to three weeks.

One of the most interesting pastures was that exhibited by Messrs. A. G. and B. Clyne, of Newry. This pasture was sown in June, 1938, with 20 lb. of Clunes perennial rye-grass and 5 lb. cocksfoot per acre. A strain of wild white

Hay reserves on the property of Messrs. Whittakers and Co. and Onley, Newry.

clover was already there, and this was luxuriant at the spring inspection. This pasture demonstrated very well the importance and value of regional strains of good pasture species. The prolific growth on this pasture of 10 acres provides grazing for 60 high-producing Jersey cows for three or four days out of every eighteen to 24 days.

Lucerne Section.

In the lucerne section Mr. L. Donahoe, of Boisdale, won first place with an excellent stand sown in November, 1937, with 14 lb. Marlborough lucerne. The ground was irrigated prior to seeding. Two hundredweight of superphosphate per acre was applied after germination. The dressing was increased to 3 cwt. in 1938, and to 4 cwt. per acre last year. This is a dense stand almost entirely free from weeds, and the plants have a very vigorous and healthy appearance, much of which is due to the liberal treatment with manure. Marlborough is a very good strain of lucerne from New Zealand, and has given good performances in departmental tests.

The paddock is well graded and very uniform except for one small patch. During the past season it had been watered three times. In the district generally, lucerne is seldom watered, since good yields are obtained from deep subsoil water. The stand had been cut four times during the season, and 12 tons of hay from the 5 acres were harvested at one of the cuts. The autumn growth had been grazed up to within ten days of the second inspection.

Mr. A. Little's exhibit at Nuntin, which won second place, was sown in August, 1938, with 10 lb. seed and 1 cwt. of manure. It had no further top-dressing until April this year, when one bag per acre was applied. It was a clean uniform stand on a very well-graded paddock one-third of a chain wide, and with excellent provision for drainage.

Although watered four times during the season, the stand showed signs of dryness at the autumn inspection, and as it had been grazed off not long previously it did not present such an attractive appearance as at the spring inspection. However, the dense stand was very free from weeds, and the young growth was vigorous—three cuts had been taken off prior to the grazing.

BEST 3 ACRES OF LUCERNE, MAFFRA.
(Two Inspections.)

Exhibitor.	Layout for Irrigation and Condition of Channels.	Apparent Yield.	Quality.	Uniformity.	Freedom from Weeds.	Total.	Grand Total.
	20	20	20	20	20	100	200
L. Donahoe	18	18	19	18	19	92	
	18	17	19	19	20	93	185
A. Little	18	17	17	19	19	90	
	19	15	17	19	19	89	179
E. J. Pearce	18	18	18	19	18	91	
	18	16	18	18	17	87	178
L. H. Semmens ..	17	16	19	18	19	89	
	18	15	17	18	19	87	176
C. R. Daniel ..	18	15	16	19	18	86	
	18	17	18	18	18	89	175
W. Amey	17	17	16	18	17	85	
	18	18	18	17	18	89	174
T. M. Noble	17	16	18	18	17	86	
	17	17	18	18	17	87	173
A. J. Jessep	18	18	18	16	16	86	
	18	18	18	16	17	87	173
R. D. G. Singleton ..	17	15	18	18	15	83	
	18	17	18	18	16	87	170

Third place was won by Mr. E. J. Pearce, of Boisdale, whose paddock of 6 acres was sown in October, 1939, with 12 lb. of seed and 2 cwt. of superphosphate per acre. This paddock had been in various crops for twenty years previously. This lucerne receives 4 cwt. of superphosphate per acre each year, and is watered four or five times. There is good drainage to a lagoon. The hay is stored in an excellent shed, which will hold approximately 150 tons. About this amount of meadow and lucerne hay has been conserved this year on this block of 86 acres, of which 28 acres have been sown down to pasture and 6 acres to lucerne. The lucerne was watered only three times this season, and the fifth cut was taken off about a fortnight prior to the second inspection.

That the vigour of a lucerne stand can be prolonged for a good number of years by good treatment in respect of manure is well exemplified by the stand exhibited by Mr. A. J. Jessep, at Tinamba. This was sown twelve years ago, and if it had not been damaged by a heavy flood in April, 1935, it would have been outstanding from a show point of view. After the original dressing of 90 lb. of superphosphate per acre at seeding, it had no more manure for three years. It began to deteriorate, and during the next eight years it was given one bag per acre each year. Last year this dressing was doubled, and Mr. Jessep is convinced of its value. Despite large patches where the lucerne had thinned out owing to flooding, the stand has produced an average weight of nearly 1 ton per acre at each of the five cuts this past season. This is a remarkable performance for a twelve-years-old stand of lucerne. Only two waterings had been applied during the season.

In conclusion, one must comment on the general high standard of both pasture and lucerne fields entered in this competition. This fact, combined with the very large number of entries, rendered the task of the judge somewhat difficult. Perhaps some of the competitors lost points during the second inspection through this occurring rather later than was intended originally, but this delay in completing the judging was due to unavoidable circumstances.

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest.

QUESTION.—Which is the best method, considering convenience, of docking lambs' tails? (The questioner adds that he uses the bloodless castrator on the purse.)

ANSWER.—Tail docking can well be carried out with this instrument and as a general rule, better results are obtained in using the bloodless castrator on younger lambs. The jaws of the instrument are brought together at the required position and the bone is crushed. It is then necessary to run the knife around the inside curve of the jaws to completely sever the tail. The edges of the skin will remain together. With strong, well developed lambs it is essential that the tail should not be docked too short with this instrument, as in most cases, necrosis or death of the crushed bone and consequent loss of the skin up to the next joint almost invariably follow. With such well developed lambs, for example stud lambs being kept with the idea of showing, it is preferable to use the knife and cautery.

QUESTION.—Is it a wise practice to inoculate lambs for pulpy kidney and mark them at the same time?

ANSWER.—It is quite safe to inoculate lambs for pulpy kidney at the same time as marking provided that every care is exercised, particularly in regard to cleanliness and that the operation is not performed by the same man who is carrying out the marking.

QUESTION.—Three months ago one of my sows had a litter of eighteen pigs, nine of which were dead but well developed in every way. The sow was fed on crushed wheat, sometimes pollard instead of wheat, and skim milk. Before farrowing the sow was in good condition. Can you give me any explanation for the deaths?

ANSWER.—The young pigs possibly died during farrowing. Whether they died at farrowing or some time before, the probable cause was faulty nutrition of the sow. To prevent a recurrence of the trouble the sows should be run on pasture and during dry periods, when good pasture is not available, lucerne or clover chaff may be added to their diet. Also, the provision of a mineral mixture composed of three parts of ground limestone with one part of salt should be fed to the pigs at the rate of 1 oz. daily for each 100 lb. live weight of young growing pigs and 2 oz. per head daily for breeding sows.

The Grasshopper Pest

By T. McCarthy, Chief Entomologist, Department of Agriculture, New South Wales

To study and report on campaign methods and to obtain practical information with reference to locust and grasshopper control in other countries Mr. McCarthy went abroad during 1939. While in America he was fortunate to see one of the greatest grasshopper invasions on record and in addition, obtained extensive practical experience in the actual field work. The following is a summarised report on the control of these pests in the United States of America, Canada and South Africa.

AS in Australia, hundreds of species of grasshoppers and locusts occur in the United States of America, Canada and South Africa, but of these very few are of economic importance. In the United States of America, practically all the damage is caused by seven species. These include the differential grasshopper (*Melanoplus differentialis*), the two-striped grasshopper (*M. bivittatus*), the red-legged grasshopper (*M. femur-rubrum*), the clear-winged grasshopper (*Camnula pellucida*), the lesser migratory grasshopper (*M. mexicanus*), the long-winged migratory grasshopper (*Dissosteira longipennis*), and Packard's grasshopper (*M. Packardi*).

Of these, the lesser migratory grasshopper (*Melanoplus mexicanus*) and the long-winged migratory grasshopper (*Dissosteira longipennis*), which attack both crops and pastures, are known as the migratory grasshoppers, and the remainder as crop or native grasshoppers, as they lay their eggs chiefly along fence lines and along roads adjoining crops, and do not infest such extensive areas of country. In general, it may be said that grasshopper outbreaks in the United States of America usually occur in the western two-thirds of the country, and while some of the above-mentioned species may be found throughout that area, some are restricted to parts of it only, or are more abundant in certain areas. Thus, while the lesser migratory locust is very widespread, the severest outbreaks occur in the northern great plains.

With regard to the relative importance of the species concerned, there is no doubt that the lesser migratory grasshopper is the most important individual species. It is found throughout the United States of America, but it is more abundant in the northern great plains of Montana, North and South Dakota, and to a lesser extent in the Rocky Mountains and Plateau States. I saw immense areas of poor ranges and idle land country uniformly infested with this species. Although it is a comparatively small species it is a strong flier and capable of migrating long distances, and may therefore reach the better and more extensively cropped agricultural country to the south, and cause enormous damage to crops.

The lesser migratory grasshopper.

The next species in importance is probably the long-winged migratory grasshopper, which occurs chiefly in Colorado, but also extends over the borders into New Mexico, Oklahoma, Texas and Kansas. It is chiefly a range grasshopper, but is capable of uniformly infesting large areas of country and migrating long distances in huge swarms.

The remaining species referred to are mainly regarded as crop grasshoppers, and while none of these infest such large areas as the two above-mentioned, collectively they cause enormous damage to crops throughout the United States of America.

In Canada the prairie provinces of Manitoba, Saskatchewan, and Alberta, which are a northern extension of the great plains of the United States of America, and the interior of British Columbia are the regions most heavily infested. The lesser migratory grasshopper, the clear-winged grasshopper, the two-striped grasshopper, and Packard's grasshopper are also found in these regions, but the two first-mentioned stand out as the two most destructive species to grasslands and crops in the Dominion of Canada.

In South Africa the brown locust (*Locustana pardalina*) and the red locust (*Nomadacris septemfasciata*) are the outstanding economic species, and of these the brown locust is perhaps the more important, because of its more frequent occurrence, involving as it does an almost annual expenditure of large sums of money for its control.

The brown locust has its origin in the Karoo, a semi-arid region of the Cape Province. Major outbreak centres occur in the vicinity of Middleburg and Hope Town, and from these centres large swarms of locusts may migrate east and north-east to the better agricultural land, even as far north as Southern Rhodesia. Investigations in recent years have shown that the important outbreak centres of the red locust occur in Northern Rhodesia and Tanganyika Territory, but in view of the immense territory that may be subject to invasion by the red locust in years of major outbreaks, it seems likely that further important outbreak centres will be located.

The Australian Problem.

During my visit to the United States of America, Canada, and South Africa the infestations were among the heaviest on record. I had, therefore, the opportunity of seeing both the infestation in the field and the extensive control operations being carried out. One could not help being impressed with the colossal nature of the problem, particularly in the United States of America, compared with the problem that we have to face in Australia.

I would like here to draw attention to the fact that the Australian plague locust forms definite swarms which are generally confined to comparatively small areas of from a ½ to 5 acres. More occasionally they spread out into long narrow bands, and may extend for some miles in that formation.

In the United States of America and Canada, where the lesser migratory grasshopper and the long-winged migratory grasshopper are the most important species, enormous areas were infested, particularly in the States of Montana, North Dakota, the prairie provinces of Canada and Colorado. These two species are more of the grasshopper than the locust type, and do not therefore concentrate in isolated dense swarms. Instead they are uniformly scattered over hundreds of square miles of poor range and unoccupied country in sufficient concentrations to eat out pastures, and to produce enormous flights of adults that reach crops in better agricultural country far from the areas in which they have developed. For this reason many of these potential flight areas of hundreds of square miles of bad and idle lands were systematically and uniformly treated with batteries of bait spreaders.

After seeing these huge areas being treated, one could not help being impressed with the limited nature of our problem as compared with that of the United States of America and Canada.

In South Africa the two most important species, the brown locust and the red locust are of the locust type, and in the hopper stages concentrate in dense swarms much as our species does. The problem there is very similar to ours, but the size of the swarms and the total area infested are much greater than ours, and therefore add to the difficulty.

Control Measures.

Poison Bait Formula.

In all countries visited where grasshopper control had to be undertaken, the use of poison bait had become the standard method of control. In the United States of America and Canada sprays have not been used for many years, and in South Africa spraying with arsenite of soda solution, which was the method employed for many years, has been entirely replaced by the use of poison bait. Poison bran bait has superseded all other methods of control.

The formula for the poison bait differs, however, in some respects, from that employed in

Australia. In South Africa, wheat bran as the carrier for the poison is replaced by straight run maize meal or ground maize bran. This is not because maize meal or bran is a more efficient base than bran, but largely I should say for the reason that maize meal or maize bran is more readily available than wheat bran in South Africa.

A continuous bait mixing station in the United States of America. This type of station is kept in operation day and night.

No molasses or other sweet attractant is used, as it has been found that the locusts take the bait quite readily without it. The formula used in South Africa, therefore, consists of:—

Arsenite of soda (80 per cent.) ..	29 oz.
Silica graphite	12 oz.
Maize meal (straight run) ..	84 lb.
or	
Ground maize bran	64 lb.

The ingredients are mixed dry in a mixing machine, placed in bags and stored until required. To prepare the bait for use 8 to 10 gallons of water is added to make the bait into a mash. The silica graphite is used to discolour the maize meal, so that the poisoned material can be readily recognized.

In the United States of America and Canada the poison bait differs from ours by the absence of molasses or other attractant, the use of sawdust, liquid arsenite of soda, and in the quality of the bran used. As in South Africa molasses is considered unnecessary for their species also. The carrier or bran used is referred to as mill run bran or shorts. It contains a considerable proportion of pollard or flour-like material mixed with flakes of wheat bran.

Sawdust is used extensively in the bait, and is mixed with the bran. The formula varies somewhat from place to place, particularly in the proportion of sawdust used and in the quality of the mill-run bran or other such material used. In general, however, the standard formula used in the United States of America and Canada might be set down as follows:—

Mill-run bran or shorts ..	25 lb.
Sawdust (three times bulk of mill-run bran	3½ bushels
Liquid sodium arsenite (32 per cent. AS_2O_3) ..	½ gallon
Water	10-12 gallons.

When the bran and sawdust mixture is moistened with the sodium arsenite and water, the finer material in the bran is said to form a poisoned paste which coats the particles of sawdust. The grasshoppers gnaw and chew the sawdust to obtain the paste and are killed by it. The sawdust is not eaten after the paste and moisture have been removed from it.

It will be seen that in the United States of America, Canada and South Africa the

Another type of mixing station, Colorado, U.S.A. Bait is prepared at this centre as required.

A hand mixing machine as used in Pretoria, South Africa.

molasses or other sweetening agent has been considered unnecessary. It is conceivable, and perhaps likely, that our species which is different from the species in those countries will take the bait equally well without it, and experiments to test this are in progress.

Should it be found that the molasses is unnecessary here also, a very considerable saving can be effected. The use of sawdust should also be considered, although I am doubtful if sufficient would be available for a big campaign. Its use would also cheapen the cost of the bait, although it seems inevitable that it would have to be transported long distances, and the railway freight may offset any saving that its use may effect.

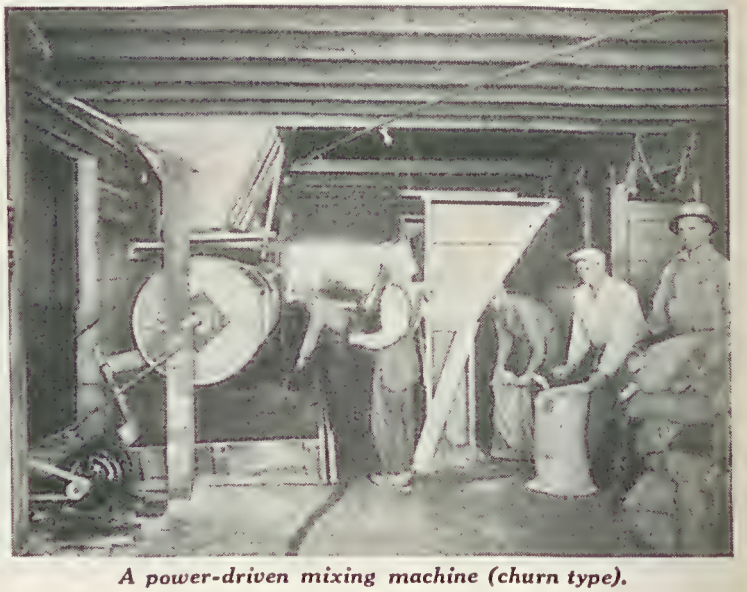
Mixing and Spreading Machines.

The need to supply large quantities of bait ready for use and to cover large acreages of infested country, particularly on abandoned or idle lands in the United States of America and Canada, has made the adoption of mixing and spreading machines absolutely essential. Consequently all the bait is mixed and spread by machinery, and when it is realized that during my stay in the United States of America, nearly 300,000 tons of mixed bait was used, it will give some idea of the extent machines were used for the purpose of mixing and spreading the bait.

Mixing Machines.—As in our campaign, mixing stations were established at strategic points in the various States infested. Many kinds of mixing machines were employed at these stations, and these depended largely upon the volume of bait to be mixed and to some extent on the local equipment available. Some of the more common types in use consisted of revolving boxes or churns driven usually by a 2-h.p. motor or concrete mixers of various types. These proved very satisfactory when the volume of bait did not exceed 500 bags of bait per day.

Where larger quantities of bait were required, continuous mixing machines were constructed. These consisted of cylinders some 16 feet in length and 2 to 3 feet in diameter, which revolved continuously while the bran and sawdust and the arsenical solution were continuously fed into the upper end of the cylinder. The bait in its progress through the revolving cylinder was, by the aid of baffles or revolving devices, thoroughly mixed before it reached the outlet end where it passed into the sacks. Plans and specifications of all these mixing machines were obtained. The advantages of mixing machines are that the materials, particularly the arsenite of soda, need not be handled by the operator, a more uniformly mixed bait is ensured at a less cost than if mixed by hand, and a much greater quantity of bait can be turned out per day.

It would seem to me that the churn type of mixing machine would be very valuable at mixing stations in Australia, and could be con-



A power-driven mixing machine (churn type).

structed at comparatively small cost, and its use would reduce the amount of labour at present required.

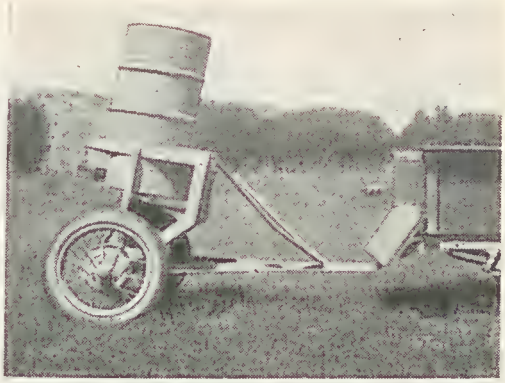
Spreading Machines.—For the control of the two species of migratory grasshoppers, spreading machines were used extensively. Indeed it would not have been possible to treat such large areas of country without them.

Endgate seeders, straw spreaders, and other devices were sometimes adopted for the spreading of the bait by attaching them to utility trucks or other vehicles, but the trailer type of spreading machine constructed by the Bureau of Agricultural Engineering, in co-operation with the Bureau of Entomology and Plant Quarantine, was the type of machine chiefly used. Thousands of these machines were in use.

This type of spreader is drawn by a utility truck and is capable of covering 20 acres, or more, per hour, according to the nature of the country to be baited. It is capable of distributing the bait evenly and in any quantity per acre. The use of mechanical spreaders of this type reduces the cost of spreading the bait, and enables large areas to be treated in the short period of the day favorable to bait spreading.

This machine is constructed from the rear axle and wheels of an old model T Ford car. The original drive shaft is placed in an upright position and is attached to a sheet-iron disc 3 feet in diameter about 5 feet from the ground. The bait container is placed immediately above this disc, and by means of an agitator within the container the bait is dropped through regulated slits on to the disc, which revolves rapidly, at the same time throwing out the bait evenly in a swathe 40 to 60 feet wide. This machine could be adopted in

Showing the undercarriage of a spreading machine.



The type of spreading machine used in the United States of America.

Australia with great advantage where the locusts have spread out over wide areas. Plans and specifications of this machine were obtained.

In South Africa the bait was mixed with mixing machines at a central depot in Pretoria, but the bait was being spread by hand, although some types of spreaders had been tried.

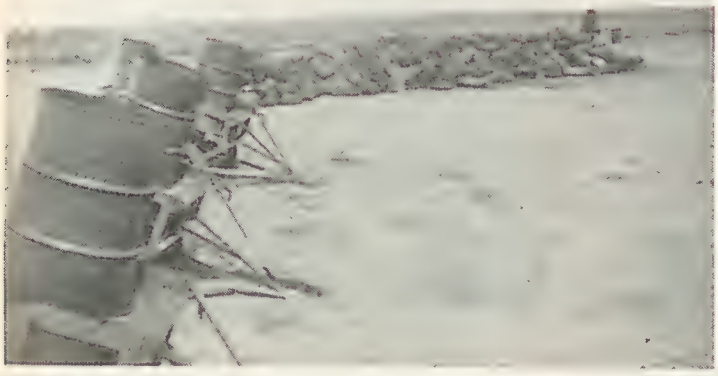
Aeroplanes for Baiting Large Areas.

During my visit abroad, aeroplanes were not used for bait spreading in any of the countries visited. In the United States of America, however, because of the magnitude of the problem aeroplanes were receiving consideration because of the time taken to treat large areas with spreading machines, and the number and man power required to treat large areas of infested country.

Experimental work was in progress both at Miles City and Sidney, in Montana, but even a suitable mechanical device for attachment to the planes to spread the bait had not been developed, and I came to the conclusion that the use of aeroplanes for the spreading of poison bait was still in the experimental stages.

Parasites.

In all the countries visited, various species of parasites were present either as parasites of the adult grasshoppers or locusts, the nymphs or the eggs. On occasions a fairly high percentage of parasitism was recorded, but in none of the countries was the opinion held that parasites had or were likely to prevent grasshopper outbreaks. The most that could be said of them was that when the outbreak of grasshoppers or locusts had reached its peak, parasites in some instances contributed to its decline.



Bait and spreaders

In the United States of America and Canada several species of the family *Sarcophagidae* occur, and of these *Sarcophaga kellyi* and *Sopifera* are the most common parasites of the nymphs and adults. The bee fly (*Systoechus vulgaris*) is probably the most important fly parasite of the eggs of grasshoppers, but *S. oreas* has also been recorded.

Marked fluctuations of these parasitic flies invariably occur. In some years they are numerous and in others almost entirely absent. Flies of the genus *Sarcophaga* may also be injurious, and their introduction cannot therefore be considered.

The larvae of several species of blister beetles, of which *Macrobasis subjabra* is the most important, attack the eggs of grasshoppers. The adult blister beetles are very injurious to plants. The small Hymenopterus egg parasite *Scelio luggeri* is sometimes abundant, but usually of minor importance.

In addition to the above-mentioned parasites, predatory beetles, robber flies, and other predatory insects have been recorded.

In South Africa the sarcophagid fly (*Wohlfahrtia euvittata*) appears to be the most important. It is parasitic on the egg pods of the locusts, but although very numerous on egg beds I inspected in the Karoo it had not appreciably reduced the hatching of the locusts. It is also parasitic on the nymphs and adults.

The bee fly (*Systoechus albidus*) and the calliphorid fly (*Stomarhina lunata*) are also parasitic upon the eggs, but do not exercise any appreciable control. Ground squirrels (*Geosciurus*) and the meercats (*Suricata*) also destroy a percentage of locust eggs.

Other Methods of Control.

In agricultural areas of the United States of America and Canada several other practices, mainly cultural, are recommended as auxiliary methods of control. Fall ploughing is regarded as a valuable auxiliary. It is claimed that eggs can be buried so deeply by autumn ploughing with a mouldboard plough to a depth of 5 inches, that the young "hoppers" cannot make their way to the surface.

The migrations of young grasshoppers from an infested field can be checked by ploughing guard strips about a chain wide round the field. If these strips are kept free of growth the ploughing of the field can be completed, and the hoppers then killed by baiting. Grasshopper infested land which is to be summer fallowed should be ploughed before the eggs hatch.

Where seeding is done on land not summer fallowed, the land should be cultivated before sowing. "Stubbling in" or sowing in stubble land without any preliminary cultivation, a practice common in the United States of America, is strongly deprecated.

Early sowing is considered to be an important factor in reducing grasshopper damage and barrier strips; trap strips and burning off with straw are other methods of control that are advocated under various conditions.

Pasture Renovation Work.

In the northern great plains of the United States of America and the prairie provinces of Canada, there are large areas of depleted range country and abandoned lands very suitable for egg deposition by grasshoppers. It would appear that this range pasture has been largely depleted by over-grazing and that the abandoned lands are the result of attempts to grow crops, such as wheat, for which it was found to be entirely unsuitable, and then abandoned. The result has been that such country has failed, even after some years, to recover its normal condition, and because of its sparsely-covered surface has provided additional country suitable for egg deposition by the lesser migratory locust (*Melanoplus mexicanus*), a species which prefers light and sparsely-covered country for its breeding grounds.

In both the United States of America and Canada, much research work is being done to remedy this position, and a study is being made of the effect of various treatments and grazing practices on the botanical and chemical composition of the vegetation. This study includes artificial re-seeding of depleted pastures, artificial re-seeding of idle or abandoned lands, the effects of surface cultivation on the native growth, the effects of fertilizers and the eradication of pasture weeds which have largely replaced the original cover. While the object of this work is primarily intended to improve the pasture, it would, if successful in that direction, also be of some importance in reducing the incidence of the lesser migratory grasshopper (*Melanoplus mexicanus*).

Poisoned bait in the field ready for use.

It is from this latter point of view that some consideration might be given to this aspect of the question in Australia. It is, of course, well known that the Australian plague locust prefers to lay its eggs in very hard-scalded or sparsely-covered patches of reddish country. It rarely lays in stubble and only occasionally in black soil country. These scalded or sparsely-covered areas occur throughout the region which the Australian plague locust infests, and in some districts areas are known in which the locusts always deposit their eggs whenever major outbreaks occur.

It is thought that if these areas were rendered unsuitable for egg deposition, particularly in and near the vicinity of any outbreak areas that may be discovered, it may have some useful influence in reducing the incidence of locust outbreaks. It is possible that such areas may be rendered unfit for egg deposition by (1) re-seeding with suitable grasses; (2) planting suitable trees or shrubs in the areas; (3) by ploughing the areas just prior to grasshopper flights or by any other methods that may be thought to be of value.

While it seems best that such a scheme should at first be carried out in regions where locust outbreaks originate, I can see no reason, if a satisfactory treatment of these areas suitable for egg laying is developed, why it should not be applied as a long-range plan to the entire central division of New South Wales. It would of course be necessary for a survey of the areas to be made in the first instances, but with a Soil Conservation Service now available and the co-operation of other branches of the Agricultural Departments, it is possible that a great deal could be accomplished in time, and many areas that are now potential breeding grounds rendered unsuitable for egg deposition.

Research Work.

The primary purpose of the research work programme in the United States of America, Canada, and South Africa is to prevent large outbreaks of grasshoppers or locusts. By studying past outbreaks, and by field observations it is hoped that the most important economic species can be localized. Observations on intensive study areas and special observation stations are also expected to yield information on the plant associations favored by grasshoppers or locusts, and to indicate physical habitats where species are likely to occur.

From the information thus gained it is believed that large areas not suitable for permanent grasshopper development can be determined and eliminated and survey work conducted more intensively in areas which have proved to be more suitable for permanent grasshopper development. Since it is believed to require a number of years for grasshoppers or locusts to increase from normal to plague numbers, it is expected that the intensive study of these areas suitable for permanent grasshopper development will provide ample time to initiate control measures in these more localized areas, and thus prevent a general outbreak.

For the purposes of this work, intensive study areas of approximately 8 square miles have been marked out in various States. Thus, ten areas have been established in the great plains —four in Montana, two in North Dakota, two in South Dakota, and two in Colorado. The intensive study areas are located where the species to be studied has occurred in outbreak numbers, and where it is expected to occur in some numbers every year.

In selecting the area, consideration is also given to its general topography, soil types, and plant associations, and that the whole area is representative of the locality in which it is selected. Collections of grasshopper material and observations are made on at least every quarter section (160 acres unit), throughout the intensive study area. Generally, there are four inspections each year, and information is obtained on the number of adult grasshoppers per square yard, their egg-laying habits, general activities, and food preferences. In the autumn, the average number of egg pods per square foot is determined, and in the spring an estimate of the egg survival is made. All records are made by the methods laid down by Shotwell.

The research work in Canada is carried out on similar lines to that described for the United States of America. In South Africa intensive study work has been carried out on both the brown locust and red locust, but particularly on the former, on which extensive and excellent work has been done. The procedure adopted here also is similar in most respects to that carried out in the United States of America. The outbreak region of the brown locust, which occurs in the semi-arid country of the Karoo, appears to be clearly established and the outbreak areas and centres within that region clearly defined. Notwithstanding this, it would appear that the knowledge of these areas has not been as helpful in control as was expected.

As before stated, the object of this research work in intensive study areas is to locate the areas where an economic species occurs in limited numbers every year, whether it is in outbreak numbers or entirely absent elsewhere. It is from these areas or outbreak centres that major outbreaks are believed to originate. Thus, the solitary forms (phase solitaria) in an outbreak centre respond to certain stimuli and develop into the phase transiens, producing incipient swarms which in turn gives rise to the phase gregaria, and produce major outbreaks over extensive areas far beyond the original outbreak centres.

It is claimed that by being able to locate these incipient swarms of phase transiens, they can be destroyed over a comparatively small area at limited cost and widespread major outbreaks prevented. This theory does not seem to have worked out so well in South Africa where the phase theory has received so much attention.

Certainly they have mapped out the outbreak centres and have endeavoured to treat incipient swarms of phase transiens, but the degree of control obtained did not prevent major outbreaks of locusts of the phase gregaria which still had to be treated later. It was therefore decided to concentrate mainly on the destruction of the major swarms of the gregarious phase. This change of policy was decided at a conference of senior locust officers held at Pretoria in August, 1939.

It was considered at the conference that the policy in connexion with the destruction of incipient swarms (phase transiens) be amended for the following reasons:—

(1) "A large percentage of hoppers succeed in attaining the adult stage notwithstanding the heavy expense, because in the majority of cases only a small percentage of the hoppers occur in combatable swarms. Destruction of small swarms is further complicated by the fact that different stages of development of hoppers occur in the same swarm. The final result of the destruction of incipient swarms firstly does not justify the expense, and secondly does not prevent the formation of large swarms which migrate from the area."

(2) The solitary locusts present in the same area in which the destruction was attempted continue to produce incipient swarms. In regard to incipient swarms, the conference therefore recommended—

(i) that the destruction of incipient swarms be limited to concentrated swarms of the first instar; and

(ii) that the destruction of incipient swarms be restricted to those in which 80 per cent. of the hoppers are of the same age.

(3) Whenever 30 per cent. or more of the total hopper population occur in scattered formation or in different instars, destruction should not be undertaken.

Portion of a bait spreading battery.

Effect of Baiting on Birds, &c.

In the United States of America, Canada, and South Africa, inquiries were made regarding the effect of baiting on bird and animal life, and all the entomologists connected with grasshopper and locust control were emphatic that the poison bait, if properly spread, was not a menace to livestock, poultry, birds, and wild animals. They were equally emphatic that birds and other animal life were not affected by feeding on poisoned grasshoppers.

To support this opinion, extensive observations, inquiries, and investigations were made in the United States of America between 1934 and 1937, and the conclusions were that there was no evidence that birds or other animals were endangered in any way during widespread baiting campaigns. During that period, country agents were instructed to watch for and investigate any reported cases of killing of game and song birds.

A great many birds were examined during extensive baiting campaigns, in which death was attributed to grasshopper poisoning, but in every case it was found that the deaths were not due to arsenic poisoning.

A similar finding was recorded in South Africa.

Organization for Control.

In the United States of America, Canada, and South Africa the cost of locust and grasshopper control is borne by the Federal or State Governments except perhaps in the State of British Columbia, where the landholders are levied on an acreage basis. In the United States of America during the period May to August, 1939, nearly A£1,000,000 was appropriated and spent on grasshopper control. In South Africa, £162,000 sterling was provided and spent in 1938 on grasshopper control by the Union Government, and the average annual cost to the Government for the past twenty years is set down at approximately £100,000 per annum. It would appear that the results obtained have fully justified this huge expenditure.

In the United States of America, where statistics are available, the figures show that the value of the crops saved in 1938 amounted to A£47,051,379, the value of the crops lost through grasshopper damage was A£22,357,794, and the cost of the control campaign was A£599,223. It is estimated that for every dollar spent, the equivalent of 79 dollars was saved.

The control of grasshoppers in the United States of America is carried out by the Bureau of Entomology and Plant Quarantine of the United States Departments, in co-operation with the State Department of Agriculture. Practically all the cost of the grasshopper campaigns since 1934 has been borne by the Federal Government, although a few of the more wealthy States do make small appropriations for local operations. The State Governments are expected, however, to provide some of the personnel required for grasshopper control in the States concerned, and officers, such as the State leader, so appointed, work in co-operation with the Federal officials in formulating a programme of work within the State and in supervising and carrying out control operations.

Liquid arsenite of soda used in the preparation of poison bait.

The State Governments and local governing bodies like the County Commissioners are also expected to establish and maintain local mixing stations and to provide for the transportation and storage of materials at their own expense. This arrangement applies to a great extent to areas infested with crop or native grasshoppers which the landholder himself is expected to control with bait provided free from the local mixing station.

As a general rule, the Federal Department of Agriculture will not undertake the treatment of crop grasshoppers for landholders, but the control of the two migratory grasshoppers is almost entirely carried out by the Federal Department of Agriculture. Not only does it provide bait materials for the control of all species, but it maintains a large staff of entomologists in the field, establishes and maintains large mixing stations, provides motor trucks, spreading machines, and labour for the distribution of the bait over immense areas of sparsely-settled country, publicly-owned land, privately-owned range country, and idle and abandoned lands.

In Canada, more particularly in the private provinces of Manitoba, Saskatchewan, and Alberta, where grasshopper outbreaks usually occur, the cost of grasshopper control is chiefly borne by each provincial Government. In these provinces the control campaign is conducted by the Provincial Departments of Agriculture under the supervision of field crop commissioners, extension service, or other Departmental officials. In Manitoba and Saskatchewan, municipal officers arrange for the opening of mixing stations, the payment of labourers, and the distribution of bait within their territories. This expense is paid by the municipalities, while the province supplies the bait materials. In Alberta the supervision of the control work is in the hands of seven or eight men each with a fixed territory. In British Columbia, the money required for the purchase of material is made available early in the spring by the Provincial Government, and the total amount expended during the year is divided amongst all the landholders, Government or private owners on an acreage basis. The average tax in the zones on the range lands of British Columbia is less than half a cent per acre and considered by all to be an excellent insurance.

Campaigns in British Columbia are conducted under the Provincial Grasshopper Control Act, and their organization appears to have several features in common with our organization in New South Wales.

In South Africa the whole of the expense of a grasshopper campaign is borne by the South African Government. Not only does it provide the labour for the mixing of the bait in a central depot, at Pretoria, but it provides the labour to treat the swarms of locusts in the Karoo and elsewhere.

The organization set up for the control of grasshoppers in the United States of America is easily the most extensive of the countries visited. The Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture is the Federal Unit responsible for conducting the campaign, and officers of the Bureau direct and co-ordinate the work in co-operation with entomologists of the States infested.

Briefly, the work throughout the United States of America is supervised by a field director. Next to him is the project-leader, and he in turn is assisted in descending order by general supervisors who cover the work in more than one State, the State supervisors who cover the work within a State, the district supervisors who supervise the work in more than one county within the State, the foremen in charge of groups of spreader units, and finally the labourers who carry out the mixing and bait-spreading work.

Co-operating with this Federal organization are the State Government officials. Chief of these is the State leader, who is usually the State entomologist. It is his duty to co-operate with the Federal officers, work out programmes of control, and decide strategic points for mixing stations. Next in place is the county leader, who is usually the county agricultural agent. He acts between the Federal and State officials and the country. He has charge of the ordering of bait materials, to make contact with landholders and endeavour to enlist their co-operation in the work. South Africa has a somewhat similar organization, although the number of officers and general equipment available are much more limited.

Contrasting the nature of the organization in the United States of America with that of New South Wales in particular, I feel that through our Pastures Protection Boards we have an organization available that should meet

[*Continued on page 294.*

Echuca and District Competitions

Irrigated Pasture and Lucerne

Report of the Judge—G. B. Rayner, B.Agr.Sc., Assistant Agrostologist

IF the 1939-40 Echuca pasture competition, which is conducted by the Echuca and District Agricultural and Pastoral Society, had to be described in a single word, "diverse" would seem to be a suitable choice. The fifteen entries extended from Gunbower Island to Koyuga; they varied from pastures which had been sown a few months before the first inspection to pastures more than ten years old. Some of the "pastures" submitted for judging were stubbles from which meadow hay had just been carted, while others were crops about to be cut for hay. The manurial treatments ranged from no manure to half a ton of superphosphate per acre per annum, and the grazing systems varied from practically continuous grazing to a monthly rotation. Some farmers showed a keen interest in the competition and apparently appreciated the mutual benefit which could accrue from a discussion between one who has been associated with experiments on irrigated pastures, and one whose contact with them has been from the practical standpoint; others were quite indifferent.

It appears desirable that competitors should have a clearer understanding of what constitutes a "pasture" for the purpose of the competition. Four entries had been sown the previous autumn, and at the time of the spring inspection had not been cut, grazed, or watered since sowing. They were excellent crops of rye-grass hay about 2 feet high with some clover at the base, growing in clearly defined drill rows. At the same inspection, three other entries had just been cut for meadow hay; on one the hay was still lying in the cocks, and the hay had been carted off the other two the day before judging. Some other entries were about to be cut for hay.

High points can be obtained by such areas for evenness, freedom from weeds, layout and condition of channels &c., nevertheless they are not, strictly speaking, "pastures," but rather crops of hay or stubbles, as the case may be. It might be contended, and indeed several farmers did contend, that the fact that a pasture had just been cut for hay should not upset the "expert," he should be able to see which species were there, to visualize what the pasture was like before cutting, and value it accordingly. Analogies are usually misleading, but a sheep entered in the show (except in the appropriate section) would not be shorn immediately prior to judging. It was recommended by the judge of the 1937-38 competition that the spring inspection should be held earlier in the year, to give all competitors a chance of presenting their entries in good pasture condition. Experience, last November, makes the repetition of this recommendation necessary.

The importance of adequate watering of pastures of perennial species was almost generally appreciated by the farmers who entered the competition; and a fortnightly watering schedule, with a shorter interval during the hot summer months, was the basis of the irrigation practice. With one exception the entrants agreed on the value of liberal top-dressing, and with one further exception

Portion of Mr. G. W. Dobson's dairy herd grazing on the pasture entered in the competition.

superphosphate was chosen—and justifiably so—as the manure for the job. However, a number of the competitors had a rather meagre conception of "liberal manuring." Although the average amount of superphosphate applied per acre was 296 lb., and one farmer went to the extent of adding half a ton, while three others applied two bags or more, there were eight entries which received a bag or less per acre.

Tests conducted at Werribee and elsewhere on this type of pasture have shown that where the watering is adequate, benefit can be derived from annual applications of superphosphate of up to 4 cwt. per acre. Two hundredweight per acre may be regarded as a minimum dressing. Heavy manuring not only increases the production from the pasture, but also makes for a more economical use of the water applied. It also favours the development of valuable species, such as white clover, to the exclusion of inferior species and weeds. The points allotted for the competition were in no way influenced by a knowledge of the amount of superphosphate used, but Fig. 1 affords an interesting correlation. In this graph the points given for freedom from weeds, mixture and evenness only have been considered, and these totals have been averaged and plotted against the corresponding manurial treatment. The graph shows a positive relation between the two.

It was surprising to find that some competitors were applying superphosphate in liberal, or fairly liberal amounts on their good paddocks, and were giving only very light dressings to their poorer paddocks, because they considered that the lower-producing pastures would not require as much plant food as the high-producing ones. This, up to a point, is true; but farmers who adopt this principle are losing sight of the value of superphosphate in building up a poor pasture into a highly productive one. If an area which is dominated by inferior species and weeds is liberally top-dressed and adequately watered, the desirable species will quickly gain the upper hand.

One entrant stated that he formerly top-dressed, but had not done so for the past two years, because he thought that his pasture was better without superphosphate. Without any knowledge of what the pasture was like before the superphosphate was withheld, this point cannot be disputed. However, it was noted that the area was badly infested with flatweed

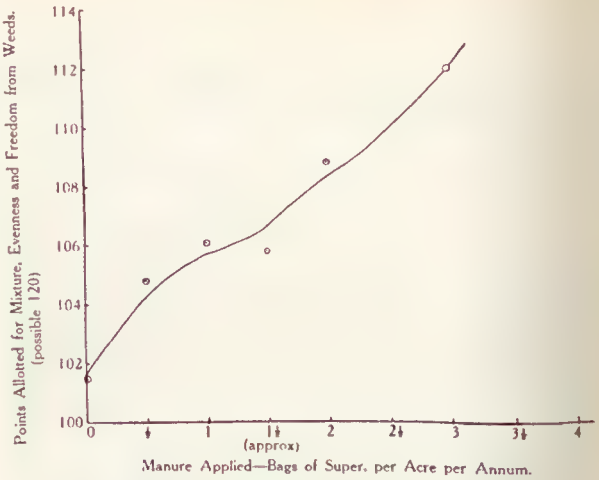


Fig. 1.—Showing the relation between composition, as reflected by the mixture evenness and freedom from weeds, and manurial treatment.

(*Hypochoeris radicata*) and other weeds, which was strikingly reminiscent of the "no manure" plots in various experimental trials. The exhibitor also claimed that since departing from top-dressing (he intends to resume it this year) his herd had suffered less bloat than formerly; but the fact that the rotation period had been lengthened from eight days to a month seemed more significant in this regard.

This introduces the subject of grazing management. The length of time for which a pasture is spelled between grazings will exert an influence not only on the yield, but also on the botanical composition, and what is more important from the point of view of animal health, on the food value of the pasture. A mowing test at Werribee has shown that the yield increases as the period between cuts increases, and that a monthly rotation combines with a high yield a desirable grass-clover balance in the sward, and a balanced diet for the stock. Whether changes in botanical composition can be induced by grazing as readily, or to the same extent, as with the mower may be open to doube; but analyses of pasture plants at different stages of growth have established that the chemical composition of the pasture will vary with the length of time it has been growing, and this should obtain irrespective of the mechanism of defoliation.

Two extremes can be arrived at. The first, and perhaps the more obvious, is to allow the pasture to come to full maturity; it will then

be undesirably high in fibre content and low in protein for a balanced diet. The second extreme is to graze the pasture every few days; this will render it too high in protein and too low in fibre. A balanced diet is achieved when the pasture is about a month old. Several complaints developed by the grazing animal, of which bloat appears to be one, are associated with nutritional disorders resulting from an ill-balanced diet; and if the pasture is grazed too frequently, the incidence of these troubles can be expected to increase. It is hard to arrive at reliable figures in regard to bloat, but Table 1, showing the incidence of pregnancy toxaemia—a disease associated with a low-fibre diet—in ewes grazing on various rotations at Werribee, should provide food for thought for farmers in the Echuca competition who are practising a short rotation.

Carting meadow hay on the property of Mr. R. F. Dinsdale.

TABLE 1.

Rotation Period.	Period for Which Pasture was Spelled Between Grazings.	Percentage Incidence of Pregnancy Toxaemia.
	days.	%
10 day	5	29
20 day	15	33
30 day	25	8
40 day	35	4

On the subject of fodder conservation little need be said; the ample storage of meadow hay was a feature of the districts visited, in fact, several stacks of hay had been carried over from the previous drought year. However, the value of silage making as an adjunct to hay production had been apparently overlooked. Perennial pastures will make quite good silage, and as this is cut at an earlier stage than meadow hay, and can be made under conditions which would render hay-making impossible, the storage of silage as well as hay will spread out the harvest operations. A high capital outlay for the construction of a tower silo is not an unavoidable preliminary to silage making, as the pasture clippings can be effectively ensiled in a stack; or in a pit or trench silo which can be constructed by farm labour.

The Awards.

First prize in the pasture section was awarded to Mr. A. E. Patman, of Echuca Village. This winning entry was not an isolated "show" paddock, not a green oasis in a desert of dry barley grass, but an excellent pasture typical of a highly productive and well managed farm. White clover, red clover, *Paspalum dilatatum,* perennial rye-grass, Italian rye-grass and prairie grass form a very well-balanced dense sward which is kept in order by frequent use of the horse mower, following grazing. The pasture volunteered on an old lucerne stand, which was sown down sixteen years ago, with 2 lb. of red clover and 8 lb. of lucerne per acre. It receives an annual dressing of two bags of superphosphate per acre, and is watered "as frequently as required," which means about every twelve days, during the hot weather.

Mr. Patman normally carries 40 to 50 head of stock, and cuts 30 tons of hay per year on his 60-acre farm. The high productivity of the winning exhibit can be gauged from the following carrying-capacity figures. This paddock of 3 acres, together with another paddock of the same area for day grazing, and with a further 10 acres for night grazing, carried 51 head of cattle during the whole of the 1938-39 drought, at the end of which nine of the cattle were sold prime fat for £9 15s. per head. A truly phenomenal record. There is scarcely a square inch of bare space in the paddock, and except for a little barley grass, and soft brome grass noted at the spring inspection, it is

practically free from weeds and inferior species. This was a very attractive exhibit and, particularly at the autumn inspection, the highlight of the competition.

Mr. H. A. Schier, who gained second prize, also entered an excellent pasture. It was sown down nine years ago with a mixture of perennial rye-grass, cocksfoot, and white, red, alsike and strawberry clovers. It now shows a very good development of white clover growing with perennial rye-grass, some cocksfoot, and a few plants of red clover, in a well-balanced mixture. The pasture is watered at fortnightly intervals, and is top-dressed annually at the rate of three bags of superphosphate per acre. It is grazed on a three-weekly to monthly rotation. In short, Mr. Schier puts into practice the principles of watering, manuring, and grazing management which have emerged from experimental work at the State Research Farm, Werribee, and elsewhere, and the very high standard of the pasture is yet another confirmation of the efficacy of these methods.

Third prize was awarded to Mr. G. W. Dobson, for a pasture which was sown seven years ago with a standard mixture of grasses and clovers. This pasture has been well treated in respect of water and manure, and has developed into a dense sward of perennial rye-grass, cocksfoot, and white clover, with very few weeds. It ranks with the first two as an exhibit of exceptional merit. Last year, Mr. Dobson applied 5 lb. of zinc sulphate per acre in addition to superphosphate; but as he was not present at either of the inspections, an opinion of the response, if any, of the pasture to this fertilizer could not be obtained.

TABLE I.—PASTURE COMPETITION—ECHUCA, 1939-40.

Competitor.	Layout for Irrigation and Condition of Channels and Drains.	Mixture.	Condition.	Evenness.	Freedom from Weeds.	Total.	Grand Total.
Maximum points	20	20	20	20	20	100	200
A. E. Patman (No. 2) ..	19	18	19	18	18½	92½	187
	19	18	19	19	19½	94½	
H. A. Schier	18	19	19	18½	19	93½	185
	18	18	18	18½	19	91½	
G. W. Dobson	19	18	18	18	19½	92½	182
	18½	17	17	17½	19½	89½	
R. Banko (No. 1)	18	16½	19	18	18½	90	177
	18	17	16½	17½	18	87	
S. Musslowhite	17½	18	19	18	18½	91	177
	17½	18	16½	17	17	86	
R. F. Dinsdale	18	17	17½	17½	19	89	176½
	17½	17	17	17	19	87½	
A. E. Patman (No. 1) ..	18½	17½	16½	17	17	86½	176
	18½	17½	18	17	18½	89½	
T. Gass	18½	18½	18	17	18	90	176
	18½	18	16	17½	16	86	
H. Allez	19½	14	13	18½	18	83	175½
	19	17½	18	18½	19½	92½	
J. R. Braund (No. 3) ..	19½	15	14	18½	16	83	173
	19½	17	16	18½	19	90	
J. R. Braund (No. 1) ..	19	14	13	18½	19	83½	172½
	18½	17	16	18½	19	89	
J. R. Braund (No. 2) ..	19	14	13	18½	18½	83	172
	19	17½	15½	18½	18½	89	
R. Banko (No. 2)	18	18	17	18	17½	88½	172
	17	17	16	16½	17	83½	
W. V. Hancock	17	17	17½	17	16	84½	170
	17	17	17	18	16½	85½	
D. G. M. Christie	17	18	5	18	18	76	166
	17	18½	18	18½	18	90	

NOTE.—Results for Spring Inspection given first in each case.

Lucerne Awards.

The lucerne section of the competition attracted only five entries, but considering the relative popularity in the districts of the two crops, this is comparable with the fifteen entries in the pasture section. The lucerne appeared to be of the same general standard as the pasture; although it is hard to base general observations on such a small number of cases. As with the pasture entries, manuring practice varied considerably; one farmer used none at all, and another 6 cwt. per acre. One can but re-emphasize the value of superphosphate, both at seeding and as an annual top-dressing, in augmenting the yield, and prolonging the life and the yearly growing period of the lucerne stand.

A stack of meadow hay cut from the exhibit entered by Mr. D. G. M. Christie.

A 7-acre paddock, entered by Mr. T. J. Schmedjie, of Koyuga, received first prize. A feature of this entry—with slopes in three directions—was the way in which it had been graded to water from three sides, with the bays converging, like the spokes of half a wheel, on a small dam at the "hub." No levels were taken, but the area was watered before grading to give an indication of the topography; and the paddock, which obviously waters very evenly with an entire absence of thin patches due to either excess or insufficient moisture, is a triumph for Mr. Schmedjie's engineering skill. This skill is further exemplified by the well-constructed concrete stops he has built in his channels. The lucerne was sown on fallow in October, 1938, with half a bag of superphosphate and 8 to 10 lb. of seed per acre; it was top-dressed with one bag of superphosphate per acre early this year.

Mr. H. A. Schier showed that he can grow first class lucerne as well as first class pasture, and had the distinction of being highly placed in both competitions. He entered a very good lucerne stand, which is in its third year. This was top-dressed with 6 cwt. of superphosphate in 1938, and the value of such liberal manuring was shown by the fact that during the 1938-39 season six cuts of hay were obtained with only three waterings.

School Plots.

The school plots, which are judged in conjunction with the Echuca competitions, were visited at both the spring and autumn inspections, but the organizers decided that the

TABLE II.—LUCERNE—ECHUCA, 1939-40.

Competitor.	Layout for Irrigation and Condition of Channels and Drains.	Apparent Yield.	Condition.	Uniformity.	Freedom from Weeds.	Total.	Grand Total.
Maximum points	20	20	20	20	20	100	200
T. J. Schmedjie (No. 1) ..	17	18	18	17	19	89	182
	19½	18	18	18	19½	93	
H. A. Schier	17	19	18	17	18	89	180
	18	18	17½	18½	19	91	
L. Bramley	16	18½	17½	16	17	85	173
	17	18½	17½	17	18	88	
J. Hare	19	13	17	18	19½	86½	170½
	18	15	16	16	19	84	
T. J. Schmedjie (No. 2) ..	18	5	10	18	19½	70½	157½
	18	15	17	18	19	87	

Pasture plots at the Nanneella Estate State School.

spring inspection only should count for points. At this inspection the plots at all three schools were in excellent condition, and made a very attractive show. The autumn visit came as a surprise to two of the schools, and the appearance of the plots this time indicated that the high standard noted in the spring is maintained throughout the year.

For the 1939-40 competition the Echuca society departed from the usual schedule of points, in so far as 20 points were allotted for "duplicate plots of mixed pasture, with various quantities of manure to each plot." If these plots are to have any value they should be carefully regulated so that the amount of manure applied to each will be equivalent to a definite quantity per acre. The system of putting one handful of superphosphate on one half of the box and double the quantity on the other half, is not likely to be of any value as a demonstration. One handful sprinkled over the area of half a box would probably represent the limit of profitable application of the manure, and no response would be seen from the extra dressing. Furthermore, if the children are to regard these plots as an experiment —and there is every reason why they should—the necessity for accuracy in experimental work should be brought before them.

It is desirable that the manurial section of the plots should not be superimposed on the species section, but should be a separate unit. Nothing elaborate need be embarked upon, for if differences are to be apparent to the eye, they will have to be very real; and with a given number of plots it would be better to have a few well-defined treatments replicated three or four times, than a greater number of treatments each represented by only one plot. It should be possible to demonstrate differences between manured and unmanured pasture, but if visible differences in the reponses to various quantities of manure are to be obtained, these quantities will have to be widely separated.

While there was little to choose between the schools from the point of view of freedom from weeds, condition of paths, and so on, Ballendella had easily the best manurial plots, which gave it a decisive win. These plots had been pegged out in a paddock of mixed pasture, and had been differentially manured with the equivalents of various manurial treatments per acre. Observations are made from time to time on the relative growth and botanical composition of the different plots. The teachers and the scholars of all three schools are to be complimented on the general excellence of their exhibits; if the attention which these young farmers pay to their plots is later applied to their farms, the future of pasture development in the Echuca district is assured.

TABLE III.—SCHOOL PLOTS, 1939-40.

School.	Varieties Grown.	General Appearance.	Freedom from Weeds.	Condition of Paths.	Duplicate plots of mixed pasture with various quantities of manure to each plot.	Total.
Maximum points	20	20	20	20	20	100
Ballendella	18½	19	19	19½	18	94
Nanneella Estate	18	19½	19½	19½	12	88½
Echuca West	18	18	19½	19½	12	87

Live Stock Notes

Reminders for June—July

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Minerals for Stock.

COMMON SALT (*Sodium Chloride*).

IN recent years, results of feeding tests and practical observations have revealed much new knowledge on the uses of minerals by stock and the presence of these minerals in pasturage and other common fodders. For Victorian farmers there is no lick that can be generally recommended for all classes of stock, although, in the majority of districts, licks of ordinary common salt (sodium chloride) should be made available to horses, cattle, and sheep, but this lick will not be necessary where common salt is present in the water supply. The use of compound licks containing small quantities of most of the minerals required by animals has in the past been recommended, but modern research has shown that these are, in many cases, not required and are therefore an unnecessary expense to the farmer. In other parts of the world the continued use of compound licks containing ingredients which are not required by the animals have not only proved wasteful, but also, in some cases, detrimental to their health. At the present time it is not possible to give complete details of the necessary mineral supplements for any animals except pigs and perhaps poultry, which require lime and salt added to their usual rations.

The principal mineral constituents required by animals, with the possible exception of lime and phosphate in some instances, are normally available in sufficient quantities in the food supply, but, in this respect, common salt (sodium chloride) is an exception. Most concentrates, conserved roughages, and pasture plants are deficient in sodium and chlorine and for this reason salt is the most frequently deficient mineral in animal feeding. In areas where the drinking water contains salt and where salt-loving, xerophytic types of plants grow, sufficient salt, or even too much salt may be available for the stock.

Most of the minerals required by animals are stored in their bodies in quantities sufficient to tide them over periods when the particular minerals may be deficient in the rations. But, compared with the amount used, a relatively small amount of salt is stored in the body. Salt is an essential constituent of all the fluids of the body; it stimulates the flow of saliva and other digestive juices when consumed in proper quantities and thereby increases the appetite of the animals. In the body of a 1,000 lb. cow only 3 to 4 lb. of salt is stored, but in producing 1,000 gallons (10,000 lb.) of milk the lactating animal will secrete about 20 lb. of salt. In a similar quantity of milk a cow will secrete about 30 lb. of calcium phosphate, while 40 lb. is contained in the body of the animal. In random analyses of common foodstuffs, the percentage of sodium and chloride is less than half that of calcium and only a fraction of that of either phosphorus or potassium. "There is no doubt that a shortage of common salt is a far more frequent cause of mineral deficiency among farm live stock than a shortage of any other mineral" is a statement made by Dr. N. C. Wright, of the Hannah Dairy Research Institute.

Working horses require a certain amount of supplementary salt both for digestive purposes and to make good losses of salt through perspiration. It can be placed in wooden boxes in places convenient to the horses. Under ordinary conditions, horses and cattle can be allowed about 20 lb. of salt per annum or 1 oz. per day, while sheep should consume about 5 lb. per annum or ¼ oz. per day.

On a few occasions cases of disorder amongst sheep, calves, and milking cows have been recorded when the animals have eaten salt to excess. At the State Research Farm, Werribee, sheep receiving an unlimited supply of salt showed a dejected appearance and were scouring badly. Their growth was also retarded. In New Zealand a parallel experience was met amongst calves. In both cases, recovery was rapid after the salt was reduced and, since only a portion of the animals was affected, it appears that only certain ones had a particular liking for salt. The feeding of unlimited quantities

of salt to dairy cows has seriously reduced the quantity and quality of the milk produced, and similar results can be expected with ewes suckling lambs. The milk yields quickly rose to normal when the salt was reduced.

On farms where salt is present in the water supply in excess of 100 parts per 100,000, salt licks are unnecessary. Salt is very useful as a conveyer of other minerals which may be required by the stock, but when the salt content of the water supply exceeds the above figure, the use of another conveyer, such as molasses, is desirable.

For pigs, salt should be fed in conjunction with lime, by mixing four parts of powdered limestone or chalk and one part of salt. About 3 lb. of this mixture should be added to every 1 cwt. of the dry feed. For poultry, from ½ to 1 per cent. of salt should be added to the mash. The lime, previously mentioned, should be supplied as shell grit. This amount of salt should not be exceeded and allowance must also be made for salt that is present in other ingredients of the ration, such as salted meat and many proprietary food mixtures. When present in the water supply any additional salt is unnecessary. As with other stock too much salt will upset the health of the birds.

As far as is known there are thirteen minerals required by animals; they are calcium, phosphorus, sodium, chlorine, sulphur, potash, iron, iodine, magnessium, copper, manganese, zinc, and cobalt. References to these will be made at a later date.

Stock Medicines Act, 1937.

The *Stock Medicines Act* 1937 was constituted and passed to safeguard the farmer from being offered worthless and dangerous medicines for the treatment of his stock and every farmer should see that any stock medicine which he purchases is labelled as having been registered within the meaning of the Act thus—"Registered under the *Stock Medicines Act* 1937" (Victoria) Lists of registered stock medicines appear annually in the *Government Gazette*.

Applications for the registration of all stock medicines must reach the Chairman, Stock Medicines Board, Department of Agriculture, Melbourne, C.2, by 1st July.

Dairy Cattle.

On 1st July a new year commences for the Standard Herd Test and local herd testing associations, and all those farmers who are not herd testing are advised to give consideration to joining up with one or other herd testing scheme. Many associations have vacancies, while new associations and units can be readily formed when sufficient local interest is created. It is only by herd testing, including private herd testing, that systematic breeding and feeding programmes can be followed.

At this time of the year there usually are more dry cows on the farm than at any other period. These should be carefully watched to see that they receive sufficient pasture and good quality roughage to build up reserves of energy, flesh, and minerals for another productive lactation period. By feeding the dry stock some supplementary roughage with a lick containing salt and, where necessary, lime, or bone meal, and then rugging or placing in good shelter those cows about to calve, milk fever and other similar troubles can be largely avoided.

The udders of the milking cows should be clipped. This will facilitate both the washing of the udders and the milking of the cows. Dehorning is recommended and this should be carried out wherever practicable as soon as the cows are dry. On soft country, the hoofs frequently grow too long. Trimming of such hoofs as soon as the cows are dry and before they become too heavy in calf is also recommended.

Mud has appeared on many farms and whenever an opportunity occurs, steps should be taken to avoid it by concreting holding yards and narrow exits from the shed. Concrete must be placed on a solid foundation or it will crack and soon break up. Thus, before concreting of muddy yards or approaches is attempted, all mud must be removed and replaced by material to form a solid foundation.

At the present time oats, ground on the farm, is the cheapest concentrate that can be purchased for the dairy herd.

Sheep.

Where possible, special pasture paddocks should be spelled in order to furnish fresh, clean pasture for lambing. The lambing ewes should be inspected at least twice daily so that necessary assistance can be given.

Ewes frequently leave their newly born lambs and, where this occurs, the attendant should endeavour to identify the mother and place her with the lamb in a "mothering pen" or enclosure made with three small hurdles and some wire netting until she accepts the lamb. Lambs, whose mothers die or cannot be found, can be satisfactorily hand reared.

At first, the hand reared lamb should be fed four or five times daily, according to size, with two to four good tablespoonfuls of fresh, warm cow's milk. As the lamb grows, more milk should be given and, for convenience, the number of feeds per day can be reduced. Lambs quickly learn to drink and, after fingering for a day or two, they will usually drink from a basin or bucket. Just as with calves, strict cleanliness of all utensils and fresh milk is essential for best results. After the lambs are one month old, they can be fed on separated milk.

In practice, it is found that lambs do better and less trouble is experienced, when two parts of cow's milk is diluted with one part of water and a small teaspoonful of sugar added for each lamb at each feed. Orphan lambs should always have access to clean drinking water and pasture. They commence eating solid food at a few days, old. They also require warm dry shelter for protection at night and on cold, wet days. On some farms it is not desirable for ewes to rear more than one lamb each. On such farms, many twins and triplets can be successfully hand reared.

In areas which were burnt by the summer fires, the new growth of grass is very immature and watery and supplementary feeding of sheep with good meadow hay for preference, or oats is advised. This applies more particularly to lambing ewes.

Horses.

Horse owners, especially breeders of young stock, are advised that, with the cold and bleak weather conditions and a scarcity of pasture which are to be expected, all stock should be well fed. This especially applies to young horses so that their growth should not be checked. Where pastures are poor, the food supply should be supplemented by the provision of a daily ration of hay. Last month carron oil was suggested as a useful addition to the ration of horses. Horse owners can prepare this on the farm by mixing together equal parts of lime water and raw linseed oil.

Stallion owners are again reminded that applications for the registration of all stallions for the coming year must reach the Chief Veterinary Inspector by 30th June. Stallion inspection parades commence on the 1st July.

The annual parade of stallions and mares which usually takes place at the Royal Show Grounds during July will not be held this year but arrangements have been made to hold a parade at Mackinnon and Cox's stables on Wednesday, 14th August. Government Veterinary Officers will be in attendance at the parade to examine any horses which are submitted for registration.

(Mr. W. D. Shew, Senior Veterinary Officer.)

Poultry.

The actual feeding of chickens is not a difficult matter if certain fundamental principles are followed carefully. Food and water may be given about 24 hours after they are hatched, although the consumption of food will be small during the first day or two. Skim-milk or buttermilk may also be given in addition to water.

When small numbers of chickens are kept it may be more convenient to use a sound proprietary mixture, owing to the small quantities of food required. The following formula, however, has given very satisfactory results :—

60 lb. ground wheat.
40 lb. ground hulled oats.
20 lb. bran.
40 lb. maize meal.
20 lb. dried buttermilk.
5 lb. fine shell grit.
1 lb. common salt.
6 lb. bone-meal, or 4 lb. dicalcic phosphate.
6 lb. charcoal.

This mixture can be given either as a dry or wet mash. The usual custom is to have a dry mash always available, and to feed a wet mash a couple of times a day. It can be fed from the first feed, when the chicks are about a day old, until they reach maturity, or until they are well grown, and then fed on an adult ration.

For a scratch grain, 60 lb. cracked wheat, 40 lb. cracked maize, and 20 lb. cracked hulled oats make a very good mixture.

It is important that the chickens should receive as much tender green feed as they can eat, at least once a day. Under certain conditions, cod-liver oil is recommended. This may be mixed with the bran and added to the mash in the proportion of ½ lb. of cod-liver oil of good quality in each 100 lb. of mash.

The greatest care must be taken to keep all coops, brooders, houses, food and water vessels, and litter perfectly clean, or the birds will become weak and ill.

(H. F. Clinton, Poultry Expert.)

Pigs.

Pig raisers frequently debate the value of grazing pigs on pasture or forage crops and in doing so value the pasture in terms of quantity of milk or grain it will save; this is an important point but not so important as the nature of the nutrients which the pasture provides. First class pasture will provide approximately four-fifths of the food requirements of mature, pregnant sows, but it is not sound practice to force young growing pigs to take even half of their food requirements as pasture. The modern young pig resembles a machine built for handling concentrated foods such as grain, milk, and meatmeal and converting them quickly into pork. If these concentrates do not form practically the whole of the diet the rate of growth is retarded, therefore pasture cannot be expected to economically provide more than about one-tenth of the food requirements of young pigs.

Young pasture is comparatively rich in protein, minerals, and vitamins, and rations of grain, mill offals, skim milk, and meatmeal, are greatly appreciated when fed in conjunction with such pasture. Deficiencies in protein, minerals or vitamins predispose pigs to infection and also restrict the growth rate, so that access to pasture is an easy form of insurance against dietetic deficiencies.

When good green pasture is not available it may be replaced by good quality lucerne or clover chaff added to the pigs' diet to the extent of 5 per cent. by weight for young pigs and 10 per cent. for breeding sows; these legume hays provide necessary minerals, vitamins, and protein which help to balance cereal grains. (L. A. Downey, Pig Expert.)

Bees.

Under normal conditions and provided that there is sufficient food stored in the beehive, the colony should not be disturbed at this time of the year. Work in the apiary should be restricted to an occasional inspection to see that the lids are secure and the hives weather tight.

Usually honey sells freely during the winter and, as there is little work amongst the bees, the apiarist who has stocks of honey has an excellent opportunity to build up a good local market for his product. All stocks of honey should be thoroughly strained and run into bright, attractive containers before offering for sale. For straining, the honey should not be hot, but warmed to a temperature of 120° to 130° F., and run slowly through finely woven cheese cloth. (J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.)

The Grasshopper Pest—*continued from page 284.*

all our requirements for a successful campaign against our plague locust. In times of major outbreaks, I am of the opinion that the staff of each Pastures Protection Board should be increased by the appointment of men skilled in locust control in order to intensify the effort being made and to encourage and enlist the co-operation of all landholders. It would seem to me advisable also to divide the central division of New South Wales into zones, preferably five, and place each in charge of a trained entomologist. Each entomologist would thus have charge of about seven Pastures Protection Board Districts, and by frequent contact would encourage more intensive effort on the part of landholders and Pastures Protection Boards under his control.

Conclusions.

(1) That a survey be made of the areas suitable for egg deposition in the central division of New South Wales, commencing in districts within and adjoining probable outbreak centres, as the first generation is not likely to migrate further than these areas.

(2) That consideration be given to the restoration of areas thus determined to render them unsuitable for egg deposition by locusts.

(3) That re-seeding, planting of suitable shrubs, or cultivation at appropriate times as well as other methods be tried to render such areas unsuitable for egg deposition.

(4) That a study be made of over-grazing as a factor in locust abundance.

(5) That the adoption of mixing and spreading machines be considered.

(6) That experiments may show that the elimination of molasses from the present bait formula and the inclusion of sawdust in the proportion of three parts of sawdust to one of bran (by volume) may produce a bait equally attractive to locusts and at a much less cost. Experiments in this direction have already been put under way since my return.

Clearing and terracing land in Sumatra preparatory to growing rubber.
[Photo by Mr. E. F. Lodge, a Sumatra rubber planter.

Rubber Growing in Sumatra

THE above photograph, which was kindly supplied by Mr. F. Woolard, of Robertson and Mullens Ltd., shows the clearing and terracing of land in Sumatra preparatory to growing rubber. It is considered that the illustration will be of interest to readers as depicting conditions under which primary production is carried out in other countries.

Each terrace is divided into stalls 13 feet long, with an earth partition in between each stall. The bund running along the front of the terrace is continuous and is 2 feet high, being beaten hard with a length of 2-in. hardwood plank. The cracking of the bunds, which can be clearly seen in the foreground, is caused by the heat of the sun.

The terraces themselves, which are on the average 24 feet apart, are cut into the hillside a distance of between 5 and 6 feet, and at the same time sloping in to the hill so that the water is held at the back. After heavy rain, hundreds of tons of water is held on the hillsides, which otherwise would wash down them taking with it much of the top-soil.

It will be noted that the clearing carries a large number of stumps. These have been left deliberately as their complicated root systems hold the soil. To dig them out would mean loosening the earth to a depth of 2 or 3 feet, thus exposing it still further to the terrific rains which occur there.

EROSION CONTROL—*continued from page 259.*

On very erodible land, vertical distances should be reduced by 6 inches, while an increase of 6 inches may be allowed in stable soils.

"Absorption terraces" which are built absolutely on the contour and allow for no drainage may be used on land which is fairly level and absorbs water readily, but this type may be a source of danger if excessive rains are received, since once the level of the water tops the terrace a break will occur, and the water pass to the lower terrace. This in turn may break and the concentrated stream of water result in much greater erosion than would have occurred in an unterraced field.

The more usual type is the "drainage terrace," which is built with a slight fall from one end to the other. By allowing the accumulating water to pass slowly across the field, this type of terrace permits the maximum absorption of water without the danger attendant on complete damming up of the water. The original type of "drainage terrace" was of a constant slope, but for terraces of a greater length than 300 feet it is usual now to make them of variable slope, increasing from 1 inch per 100 feet for the first 300 feet to 5 inches per 100 feet for that portion of the terrace in excess of 1,200 feet, thus providing for a gradually increasing rate of flow as the volume of water expands. In no case should a rate of grade greater than 6 inches per 100 feet be used on terraces. A greater gradient than this will cause erosion at the base of the terrace itself.

Cost of terracing must naturally be very variable. Figures quoted in American literature average about 20$ (£5) per mile. In the experience of Messrs. Knox, of Digger's Rest, an area of 100 acres which involved the building of 6 miles of terracing took the two Knox brothers and a hired man one week to survey and peg. The actual terracing required a further two weeks' work on the part of these three men, and the hired man spent three weeks more "topping up" the terraces and banks, with a scoop, and constructing the extensions leading to the grassed run-offs. This resulted in an approximate expenditure of £30 to £40, which included labour, tractor fuel, and wear and tear. Figures supplied recently from Temora, New South Wales, show that a field of 100 acres could be contour-banked, outlets made, and the whole paddock prepared ready for working in four days, using experienced men equipped with tractor and grader.

Broken terraces often result in more severe erosion than would occur in an unterraced field.
[U.S.D.A.

Grassed terrace outlets effectively remove drainage water without gullying.

[U.S.D.A.

Terrace Outlets.

Great care must be taken with the outlets from the terraces. Provision of grassed waterways, suitably check dammed where the slope is severe, is essential. Stock should not be allowed to indiscriminately graze these waterways, otherwise there may not be sufficient cover left to prevent gully erosion. Maintenance of terraces is important, particularly where stock have access to the paddock, although its cost is not likely to be high.

Too great a stress cannot be laid on the importance of constructing the terraces properly in the first case. Bad terraces are a worry and source of trouble from the very beginning, and may result in more severe erosion than would normally occur. Ploughing to the terraces each year usually will be sufficient to maintain them in order.

The advantages of terracing may be summarized as follows:—

1. Reduces the slope of the land.
2. Reduces velocity of the water.
3. Allows more water to be absorbed by the soil.
4. Retains the silt eroded in between terraces.

Contour Ridges.

Material assistance in controlling erosion is also obtained by performing all cultivation operations on the contour, and in cases where erosion is not severe sufficient control may be obtained by the formation of occasional contour ridges or lister furrows during ordinary cultivation operations. In deep soils, special implements may be used along the length of the furrow to form basins, the process being known as "basin listering."

Before leaving this section it is appropriate to say a word on the survey problem. The determination of the contour levels and the fixing of the lines for the terraces are not easy matters for the farmer. The services of a surveyor will save a considerable amount of time

An "A" frame level used in determining contour lines for terraces.

[Bank of N.S.W.

Showing details of the adjustable foot on the frame level. [Bank of N.S.W.

and worry. Where one is not available, contours can be determined fairly well by the farmer who has at his disposal a staff and dumpy level. On land with a constant slope, fairly satisfactory results can be obtained with the more simple type of "frame level."

This should be constructed as shown in the diagram, with a bottom overall span of 16 feet, and a vertical height of 2 ft. 3 in. between each of the two horizontal members of the frame. In order to obtain the levels for drainage terraces having a variable slope, a small adjustable foot may be fitted to one end of the frame and adjusted to give the desired fall.

Nature of Soil.

Turning to the second of our erosion factors —nature of the soil—it is apparent to any one who has observed erosion in different districts that this factor is of the utmost importance. For instance, around Sunbury erosion is active on fairly heavy clay loams with a slope of only 3 to 4 per cent., while on loams in the potato districts not far away the soil is much more stable, despite much steeper slopes and greater rainfall. It is surprising, therefore, that so little is known of the factors responsible for the varying erodibility of different soils.

The distinction is due no doubt, partly to their different geological origins, but also, in no small part, to the physical condition of the soil particles. Soils in which the aggregates break up easily when placed in water are more likely to erode than those in which the particles retain their structure and remain clumped together in relatively large aggregates. These latter soils will also tend to remain more open and not set after a rain, so that they will therefore absorb and retain a much greater portion of the water falling on them.

Soil Aggregation.

The soil constituent which is chiefly responsible for aggregation is the colloidal fraction, the clays, and the decayed humus. When these are in a dispersed or deflocculated state aggregation is poor, but when they are flocculated the physical condition is good. In this connexion it is of interest to know that Messrs.

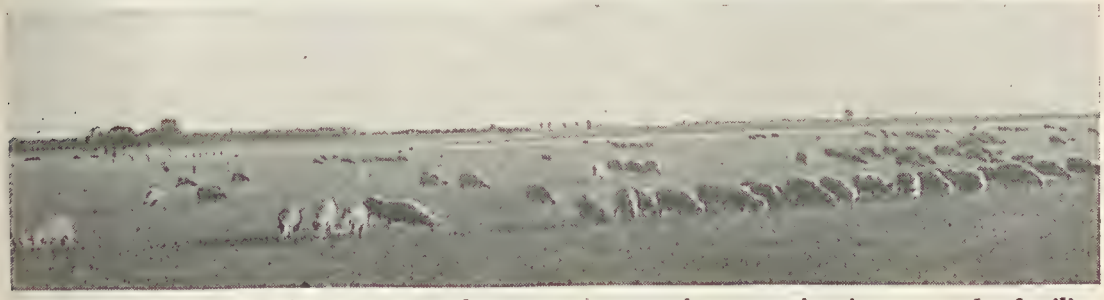
Laboratory tests showing (left) granular soil particles in normal soil and (right) loss of granulation when the humus has been removed by chemical means. The presence of organic matter (humus) is therefore important in improving soil texture and preventing erosion. [Int. Soc. Soil Sc.

Showing the basin-lister at work in California. [U.S.D.A.

Leeper and Downes, of the Melbourne University, in a recent paper, described an apparatus for measuring soil aggregation and have shown, amongst other things, that land which had been ploughed recently from pasture was very much better in this regard than land under continual cultivation.

Repeated cultivation thus tends to destroy aggregation and the physical condition of soil, thus encouraging erosion. For those farmers who must crop land which is liable to erode, the desirability of lengthening their rotation from one in which the land is continuously in crop or fallow to one in which the land is spelled to grazing for some portion of the time is obvious, quite apart from the improvement in fertility which results from such a type of rotation.

It may be that we in Australia do not pay enough attention to the desire of the "old world" farmer to retain his land in "good heart." Good physical condition of the soil undoubtedly has a number of benefits other than mere ease of cultivation, and it is more than likely that the absence of erosion to any great extent in normal European soils is due, partly at least, to the greater attention paid there to this phase of agriculture.



The inclusion of a grazing crop or a short-term pasture in a rotation improves the fertility and the resistance of the soil to erosion.

In addition to this method of improving soil texture, applications of certain substances such as gypsum or lime are known to improve certain heavy soils. Although to date experiments have not shown that applications of these materials will reduce erosion, it is possible that in some soils, by improving soil aggregation, they will assist water absorption, and so decrease erosion. Experimental evidence, however, must be obtained before such treatments can be advocated.

Care should also be taken with erosive soils to leave the cultivated surface of the land in a cloddy state and to avoid excessive cultivation during the period when erosion is likely to occur.

The advantages of improved soil texture may be summarized as follows:—

1. Decreased tendency for soil particles to erode.
2. Better absorption of water.
3. Better aeration of soil.
4. Improved fertility and higher yields of crop.

Type of Vegetation.

Turning to the third point—nature and amount of vegetation— a considerable amount of evidence has already been acquired as to the amount of erosion occurring on land under different forms of vegetation. Many experiments have been conducted in which various crops have been specially sown and the amount of erosion measured.

The figures from an experiment at Clarinda, Iowa, may be quoted as typical. This trial was conducted during the three years 1933 to 1935 on land having a gradient of 6 to 9 per cent., and the average figures showed—

Treatment.	*Percentage water run-off.*	*Erosion Index. (Based on soil lost.) Fallow = 100.*
Fallow ..	24	100
Continuous corn ..	19	89.0
Oats ..	9	21.1
Lucerne ..	6	3.7
Pasture ..	6	3.7

After much extensive work of this nature, the Soil Conservation Service of the United States of America has tabulated crops under three heads:—

Soil-depleting.	*Soil-conserving.*	*Soil-building.*
Maize	Wheat	Lucerne
Cotton	Oats	Clover
Potatoes	Millet	Pasture

It may be seen that open-row crops which are intercultivated (such as maize and potatoes) are amongst the worst offenders, crops which

Showing how a strip of grass has retarded the flow of water causing the deposition of the soil eroded from a neighboring area planted with maize.

[U.S.D.A.

Strip cropping on the contour principle.

[U.S.D.A.

are sown thickly and not cultivated (such as wheat and oats) are considered to hold the soil once they are sown, while legumes and pastures are regarded in the most favorable light, since they not only hold the soil, but also improve its fertility at the same time.

Strip Farming.

Because of the general suitability of large portions of the United States to the cultivation of maize and cotton (two of the worst erosion offenders), and the impossibility from the economic point of view of attempting any general replacement of these with a crop giving greater soil protection, the systems of strip cropping and contour farming were developed. Under this scheme, instead of sowing the whole of a paddock to any one crop in the rotation practised, each field is treated in strips, alternate strips being sown to the different crops of the rotation. Thus a soil-depleting crop such as maize would be bordered by a crop of red clover, while next to that would be one of oats. Strips are usually from two to four chains wide depending on the erodibility of the soil, and are sown on the contour so that soil eroding from the maize crop will be held by the neighbouring strip of clover. The strips are rotated from year to year.

While the principle of strip farming may be eminently suited to American conditions, its application to Australian agriculture is quite another matter. It is not at all likely, for instance, that it will find general acceptance on the wheat areas of Victoria, even where erosion is a problem, because of the general use of sheep in our wheat economy. However, it may find a place in areas of more diversified agriculture.

Contour Farming.

The principle of contour farming, on the other hand, may be of some value particularly where terraces have been erected. It is relatively easy of application in the case of row crops, such as potatoes and maize, but is not so well adapted for conditions where large-scale implements such as combines and harvesters are to be used. Practical experience has shown however, that even in these cases it is advisable to plough and cultivate on the contour in order to maintain the banks at the desired height. Tractors are much better adapted for such work than are large horse teams.

Contour farming should also be of material use in the case of orchards and vineyards. The planting of permanent fixtures, such as trees, on contour levels should not increase costs materially, and it would be an easy matter to cultivate on the contour, increasing resistance to erosion if necessary by the formation of contour ridges or furrows. Such a practice would be considerably cheaper than the annual task of many orchardists not far from Melbourne who each year have to cart the soil from the bottoms of their fields back to the tops of the rises, and infinitely more preferable to the practice of another orchardist who actually bought a neighbouring block of land

and carted the top 6 inches of soil from that block to use as a top-dressing for his own trees.

Summarizing, the advantages of strip cropping are that it—

1. Checks momentum of water.
2. Increases water absorption and checks erosion.
3. Filters out and holds the soil that is eroded.
4. Encourages crop rotation.

Planned Land Utilization.

Before closing, one should touch briefly on the broader question of planned land utilization in regard to erosion. The control of erosion on a farm can never be attained by any one method. Erosion arises as a result of a number of factors, and no one method can be expected to provide a complete cure. The first Step, therefore, should be a detailed study of the whole property in question followed by the development of a planned scheme for the best use to which each area is suited.

This obviously is the most difficult task of the whole erosion programme, involving, as it does, not only a detailed survey and knowledge of the soil and farming practices of the district, but also an appreciation of the whole system of economy on which the farm is based. In an article such as this, one can do little more than stress the importance of the subject and lay down only the broadest of guiding principles, but there are numerous examples in the overseas literature illustrating the way in which typical farms should be planned so as to reduce erosion to a minimum.

Foremost amongst these principles must be the aim to attack erosion at its source. Prevention is always better and cheaper than cure. Once water has gathered in a stream, it has a force and power which frequently can only be controlled by superhuman efforts, yet that same volume of water, dispersed into small streams, can be handled with ease.

Usually some modification of the existing subdivision of the farm will be desirable so that areas comparable as regards topography, soil type, and suitability to a given form of land use, may be grouped together. The aim should then be to plan these areas so that each field protects its neighbour. Steep slopes on the poorer soils which are usually found on the tops of the rises are often best planted in timber, with permanent pasture on the sides of the slope, cultivated areas being left to the more level land. Natural water courses must always be left in permanent pasture, and should be protected from overgrazing. Areas in which gullies have formed will have to be specially cared for by grading and the formation of check dams.

The decision will then have to be made as to the need for additional control measures on the pasture and cultivated land. If terraces are needed, the best type, their number and their slope, must be determined. Provision for adequate grass waterways as outlets must be made and care taken that they are protected. It will often be necessary to prevent water from coming on to cultivated fields by dispersing it at its source with the aid of furrows or ditches.

Finally, the problem of the best cropping system will have to be dealt with; the most desirable crops and the best rotation system will have to be decided.

So by the development of proper methods of land husbandry, erosion can be controlled on cultivated land just as efficiently as on grazing and forest lands.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

NOW that the summer annuals have been removed, the garden should be given a good overhaul. Dig up as much of the area as possible, and leave it in the rough state to enable the rain and frost to enter. Give a good dressing with lime and if not required, leave the area for a month or so before replanting. The herbaceous perennials such as rudbeckia, delphinium, and perennial aster should be lifted, subdivided and the healthy pieces replanted as desired. If more convenient, they may be stored in a sheltered position for a month or so before replanting.

Most of the evergreen shrubs that are grown for their foliage or flower in the summer or autumn may be pruned now, but it is a fallacy to think that winter time is the season to prune back every shrub in the garden. Those shrubs which flower in the early spring, such as the decorative fruit trees, weigelia and such like should be cut back as soon as they finish flowering. Plants which are cut back by frost, such as tecomas, lantanas, &c. are best left until they show signs of new growth about September. They should then be cut back beyond the frost injury.

June and July are good months for planting roses. Select well rooted plants and plant them in new soil or, if roses have grown there before, replace the old soil with about half a barrow load of new soil per plant. Roses are pruned during the winter months, with the exception of the evergreen varieties, such as Lorraine Lee and the Wichuriana group or spring flowering pillar roses, such as Dorothy Perkins. The evergreen varieties may flower in the winter, so that they are pruned in the late summer to encourage the production of rose blooms when most other roses are dormant. The spring flowering pillar roses are pruned after they finish flowering, about November. The other roses should be pruned in June, in the warmer areas, and July and even August in the colder districts.

Roses are pruned to keep them in good shape and to enable them to produce a reasonable number of blooms every year. If not pruned, the rose becomes tall with flowers near the apex and the lower branches gradually become barren and leafless. When pruning roses, the chief factors to be kept in mind are the removal of old wood to encourage young vigorous growth; to cut out all dead, sickly and weak growths; the removal of any branches growing too closely to one another or across the bush, thus enabling more light and sunshine to penetrate and the shortening back of the remaining branches to a suitable bud. When cutting back these branches, always cut above a bud and on a slant. The former helps to prevent the commencement of die-back and the latter allows the water to run off easily. When cutting back, select a plump bud and one in the direction you want the branch to grow. In most cases, a bud facing the outside of the bush is selected.

There are many beautiful roses that may be obtained, including:—

Reds—Chateau de clos Vougeot, Rouge Mallerin, Crimson Glory and William Orr.
Pinks—Dame Edith Helen, Ophelia and Lorraine Lee.
Yellows—Lady Hillingdon, Golden Dawn and Golden Emblem.
Coppery Tints—Talisman, Shot Silk and Madame Edward Herriot.
Whites—McGready's Ivory and Mrs. Herbert Stevens.
Climbers—Black Boy is a very strong grower of vivid red colour. There are climbing types of most of the abovementioned varieties.

Polyantha roses or bedding roses are very attractive when used as border plants or as low hedges. There is a good assortment available including Rufus, a red, Orleans Rose, a rose pink, and Orange King, an orange color.

Vegetables.

During June, the main work in the vegetable garden will be the preparation of the area for the spring vegetables. Give the unplanted area a good digging, leaving it in the rough state and giving it a dressing of lime. If any replacements are necessary in the perennial vegetables, or the small fruits, this is a good month to replant. The small fruits, such as gooseberries, currants, strawberries and loganberries are very useful, and no vegetable garden should be without them.

Every winter, loganberries should have all old and weak growth cut out and the vigorous young growth trained and tied in position. Gooseberries and black currants are pruned on the same principle, as a fruit tree. Two popular varieties of gooseberries are Billy Dean and Roaring Lion. They are both large berry types of good quality

and fruit quite well. Strawberries require to be cleaned up, removing unhealthy portions and the runners. The runners from the healthy plants may be used to replace casualties or for planting out new areas. Make further plantings of broad bean, early cabbage such as Eastham and Enfield Market, and onions. This is a good time to sow early varieties of culinary peas, such as English Wonder and William Hurst. Prepare an area for the main crop of Greenfeast peas which may be sown in a month or so.

When planting peas, it is not advisable to place the manure in the row alongside the seed, as this reduces the germination very considerably. Market gardeners use a pea planter that either places the manure an inch or so below the level at which the peas are sown, or about the same distance to the side. In small areas, make the furrow about 4 inches deep, put in the superphosphate at the rate of about 1 oz. per 6 yards of row. Cover it with about 2 inches of soil, sow the peas and then level up the area, so that the peas are about 2 inches below the surface.

The vegetables which are growing should be kept well hoed, so as not to let the ground set too hard after the rains.

The cabbages will require to be dusted with derris root dust as a control measure against the cabbage butterfly, and if the aphis are on the broad beans, spray them with nicotine sulphate and soft soap.

Orchard Notes

By J. L. Provan, B.Agr.Sc. Senior Horticultural Instructor

DURING this month, the deciduous fruit grower will turn his attention to the pruning of his trees. The present state of bud development indicates that there will be a profuse blossoming in the spring. During the pruning operation the grower will have to consider whether pruning will be heavy or light. Which of these courses is adopted, depends on the vigour of the tree as indicated by the length and maturity of the annual growth made last year, and the numbers and development of the blossom buds on the spurs and laterals.

In addition to a careful examination of the state of the tree with regard to pruning practice, the observant grower will examine limbs carefully for the presence of San José scale, particularly on pear trees in orchards where traces have been found in the past. If the scale is not widespread, then infested trees should be marked and particular spray applications should be given to these trees. One of the best means of controlling these scale insects is a thorough application of a combined spray of two gallons of winter oil and five gallons of lime sulphur made up to 80 gallons of water. Two other sprays which are also frequently used for this purpose are straight lime sulphur, 1 gallon in 10 gallons, or a red oil spray 1 in 14. Trees which are heavily infested with San José scale should receive two spray applications. As well as controlling San José scale, the above sprays will be found useful for red spider and bryobia mite and the lime sulphur sprays particularly, give a very satisfactory control of the pear leaf blister mite.

The peach and cherry pruner should be on the look-out for eggs of the green peach aphid and cherry aphid. The eggs of both these pests can usually be found clustered around the buds. After pruning, peach, nectarine and cherry trees should receive a 3 per cent. tar distillate spray. Thorough application is necessary if this ovicide is to be effective. The spray is best applied towards the end of June or during the first two weeks of July. In some cases, growers have applied this spray too early with the result that some egg-laying has taken place subsequently, and although the infestation is not usually heavy, the grower has been troubled in the spring by small colonies of the aphid hatched from these late laid eggs.

Orchard sanitation should be continued this month. Tree trunks, &c. should be carefully cleaned to remove overwintering codling moth, and in some orchards, mealy bug. This latter pest shelters in the bark, and removal of this loose bark followed by an application of lime sulphur assists in its control.

Brown rot of apricots, peaches and cherries can be reduced by careful orchard hygiene comprising the collection and destruction by burning of all mummified fruits and the pruning of diseased twigs and spurs. The soil around the base of the tree which normally misses cultivation should be cultivated because mummified fruit frequently lodges in these areas and spores are liberated from them in the spring.

Many growers in the northern districts are turning their attention to the cultivation of

almonds. Supplies of local almonds have not been large enough to meet the demands of the home markets, and with the interruption of imports, prospects for home-grown almonds are distinctly brighter. Well-drained soils in Northern Victoria, provided irrigation is available, are suitable for almonds. The almond tree is a particularly vigorous grower under suitable conditions and commences to fruit in its third or fourth year. The almond seedling root-stock is recommended for all plantings.

The most popular variety is undoubtedly Hatch's Nonpareil, and there is a big demand for the kernel of this nut. The principal varieties recommended in addition to Hatch's Nonpareil are—I.X.L., Chellaston, Riverside Peerless, Johnson's Prolific, Jose's B.1, White Nonpareil. Ne Plus Ultra is a good nut although it does not store well. Careful attention must be paid when planting to ensure that adequate cross-pollination is provided, otherwise almond yields are likely to be disappointing.

Suitable pollinators for Hatch's Nonpareil are—Ne Plus Ultra, Johnson's Prolific and White Nonpareil. I.X.L. can be cross-pollinated by Riverside Peerless, Johnson's Prolific and White Nonpareil. Chellaston is an early blooming variety and can be cross-pollinated by Brande's Jordan, Early Papershell and Riverside Peerless. Brande's Jordan has not been recommended as a variety to plant because generally it is a shy bearer. For pollination purposes however, it can be grafted on to trees of the varieties to be pollinated.

This winter, there is likely to be a strong demand for lemon trees. During last season, lemon supplies were definitely short, and indications are that the same situation will occur again next season. Growers who intend to plant lemon trees are advised to plant strong yearling trees in preference to older trees, unless the latter can be obtained "ball-rooted". Generally speaking however, the supply of ball-rooted trees is small and the added cost of the trees, plus the heavy freight charges, deter growers from planting large areas of this type of tree. Very satisfactory results can be obtained by planting strong, yearling trees which are received "bare-rooted" from the nurseryman. The nurseryman packs these trees in one of two ways—the roots are either "mud-puddled" and then packed in wet moss, or the mud-puddle may be omitted and the roots packed promptly in wet moss. On receipt of the trees, the mud-puddle should be carefully washed off, and both types of trees should be stood in water for about 12 to 18 hours before planting.

The top growth of bare-rooted trees should be drastically reduced as soon as they are received because the leaf area continues to draw on the tree for its moisture. The main arms should be reduced to short stubs 3 or 4 inches long, and all but four or five leaves should be removed. If this reduction in leaf area does not take place, then the tree undergoes gradual drying-out and fails to make vigorous growth in early September.

Planting can be made from August to early October, the ground having been carefully prepared before-hand. If manures are to be used at planting time, ¼ to ½ a lb. of an organic manure, of the dry blood or blood and bone types, can be mixed with the soil before planting. Care should be taken not to plant the trees deeply, and in shallow soils, surface rooting must be encouraged. The usual protection of the trunk against sun-burn by several thicknesses of brown paper wrapped round it and tied top and bottom should be made.

Wireless Talks for Farmers

WITH the co-operation of the Australian Broadcasting Commission, the Victorian Department of Agriculture is conducting a series of wireless talks on subjects of particular interest to the man on the land. These talks are being broadcast from the regional stations, 2CO (Corowa), 3GI (Gippsland), and 3WV (Horsham) on Friday evenings, the 15-minute sessions commencing at 7.45 p.m. The next talks will be on 7th and 21st June and 5th and 19th July.

Listeners desiring any information connected with the management of their farm should send a letter to Mr. J. Keane, B.Agr.Sc., Department of Agriculture, Melbourne, and a reply will be given over the air. If you do not desire your name broadcast use initials or a nom-de-plume, but do not omit to mention your district.

Galvanized Barbed Wire

New Standards Issued

THE Standards Association of Australia announces the issue of two new Australian Standards Nos. N.3 and N.4 respectively for galvanized (zinc-coated) steel wire for the manufacture of barbed wire and for galvanized (zinc-coated) barbed wire. The new standards form part of a series prepared at the request of primary producers' organizations for materials for use in primary industries. As they fix definite standards of quality for barbed fencing wire, they should therefore be of considerable value to pastoralists and graziers and to all farmers and landholders generally.

Review of experience has revealed to the committee responsible for preparation of the specifications, that only if users of galvanized fencing wire study their own problems and obtain the grade and quality most suited to these conditions and the work to be done, can the efforts made in fixing the standards be of value. Thus, for coastal areas, where high moisture and salt content in the atmosphere are encountered, or for swampy or low-lying situations inland, situations in which corrosion is always likely to be severe, the Type A (heavy-coated) barbed wire indicated in the new Australian standard should be used. For other situations, Type B (standard quality) should suffice. Special attention is urged upon all users in this regard, because it is believed that unsatisfactory service has often been experienced in the past from failure to take the necessary precaution of calling for a gauge and quality suitable for a particular situation.

The purchaser can require that each coil shall carry a tag, or bear marking showing the weight and gauge of wire and the manufacturer's name or mark. To ensure certification that the wire meets all requirements of the Australian standard, the purchaser can also require that each coil shall have attached the distinctive mark of the Standards Association of Australia (S.A.A. in a triangle) together with the manufacturer's name or mark and the number of the specification.

The Association's committee, which included representatives of primary producers and manufacturers, considered that careful selection of grade and quality by the purchaser according to situation and use, and adherence to the specification and marking by the manufacturer, will be of exceptional benefit to all concerned.

The specification No. N.3 for wire has clauses dealing with scope, standard sizes, permissible variations in size, tensile strength and bend tests, chemical tests, tests during and after manufacture of wire, inspection and testing facilities and marking. The barbed wire specification No. N.4 has clauses dealing with scope, wires (to be in accordance with No. N.3), testing after manufacture, sampling and chemical and physical testing, facilities for inspection and testing, packing and marking. As an appendix, the standard methods for determining the weight of coating on galvanized (zinc-coated) articles are included under the same cover as the specifications.

Copies of the new standards can be obtained from the headquarters of the Standards Association of Australia, Science House, Gloucester and Essex streets, Sydney, or from branch offices in all capital cities of the Commonwealth and Newcastle, New South Wales. The Victorian Branch is situated at 422 Collins-street, C.1.

Leaf Scorch of Narcissus

By C. R. Millikan, M.Agr.Sc., Plant Pathologist

LEAF scorch disease, caused by the fungus *Stagonospora curtisii* (*Berk*) *Sacc.*, has been recorded for the first time in Victoria. It was discovered on daffodils during the 1939 season. In Europe and America however, this disease has been an important cause of spotted and spoiled foliage and flowers of *Narcissus* and *Hippeastrum vittatum* hybrids for many years (1, 2).

In addition to these plants, other species belonging to the order *Amaryllidaceae*, such as *Galanthus* sp. (snowdrop), *Amaryllis belladonna* (Belladonna lily), &c., are also known to be hosts for the fungus (4).

Narcissus plants severely affected with leaf scorch disease.
[After *Creager.*

Symptoms.

The first symptoms of the disease may occur very early in the season, in the form of a yellowish or reddish discolouration of the tips of the young leaves. The affected leaf tips finally turn brown and die. Later in the season, small, secondary, scale-like spots may also appear on the lower portions of the leaves. These spots have pale or yellowish margins, and may be so numerous that the leaves soon die.

In severe cases, the leaf stalks and flowers may be reduced in size or spotted, while the premature death of the leaves may result in a severe loss in weight of the bulbs. A close examination of the diseased tissue would show

Affected leaves showing scorched appearance of tips.

Fruiting body (left) and spores of the leaf scorch fungus.

the presence of minute pycnidia or fruiting bodies in which the spores of the fungus are produced.

The spores of the leaf scorch fungus are carried in, or on, the bulb where they overwinter, and infect the new emerging shoot giving rise to primary leaf scorch symptoms. Under favorable conditions, i.e., a wet growing season, spores produced by the primary infections may give rise to the destructive secondary infections. Excessive applications of nitrogenous manure may increase the severity of the disease. The severity of the disease is usually increased after the first year, although it may occur in freshly planted stocks.

The disease is reported to affect principally Poeticus, Leedsii and Polyanthus types of narcissus, while the Trumpet and Incomparabilis forms may remain comparatively free from epidemic infection on the foliage, and from flower spotting (1, 2).

Control Measures.

Bulb Treatment.—The number of primary leaf scorch infections on narcissus may be reduced by immersing the bulbs for one hour in water, followed by a thirty-minute dip in mercuric chloride (corrosive sublimate) 1 in 750 (approximately 1 oz. in 4¾ gallons of water), or formaldehyde 1 in 120 before planting (3). The mercuric chloride solution should be placed in wooden or earthenware containers.

Spraying or Dusting.—The spread of secondary infections from infected leaf tips may be checked by four to five timely applications of Bordeaux mixture 4:4:50 or 20–80 copper lime dust (2, 3). Such treatment is necessarily of a preventive nature and should be commenced before the secondary infections are established. The best control results from picking off infected leaf tips as soon as possible after they appear.

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

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FLAX —

By W. J. B. McDonald, B.Agr.Sc., Senior Plant Investigation Officer

IT is probable that practically every farmer in this State has heard over the air or seen in the press requests sponsored by both the Commonwealth and State Governments for the increased production of flax. Since flax is a crop which thrives in temperate or cool temperate climates, it is obvious that this increased production must take place mainly in Victoria and Tasmania, and, furthermore, it can take place only in certain districts in these two States.

Recent events in Europe are the direct cause of this necessity for Australia to produce more flax. In peace time Britain is easily the world's largest importer of flax fibre. The British Empire produces normally only a little more than 1 per cent. of the world's total production, and Britain's normal manufacturing requirements are about 10 per cent. of the world's total production. Many people believe that Ireland is a large producer of flax. Although the name of Ireland has been associated with the flax industry for hundreds of years, Ireland contributes a very small amount to the world's total. Britain's imports normally come from Russia, Poland, Latvia, Lithuania, Estonia, France, and Belgium. With the invasion of Finland and later Norway, supplies through the Baltic Sea were effectually cut off. With the recent invasion of France and the Netherlands, Britain is thrown back on Empire resources for the bulk of her requirements.

Flax fibre is an essential peace-time commodity which assumes tremendous importance in war time. Besides being the basis of luxury goods such as fine linens, lawns, and cambrics, it is also the raw product from which seaming twine, sewing twine, high-class cordage, and all sorts of canvas goods are made.

In war time the demand for this latter class of goods is enormous. Boots and all forms of leather goods should be sewn with linen thread. The demand for tents, tarpaulins, fire hoses, and cordage becomes more urgent the longer hostilities last.

Australia has therefore undertaken to plant to best advantage every ounce of flax seed that can be made available to her. This undertaking is in response to a request lodged early in June by the British Government which offered to make available 400 tons of seed for the purpose, enough to sow about 13,000 acres. Unfortunately, this seed cannot arrive here until some time toward the latter end of July and this late arrival of seed confines Victoria's drive for the bulk of her flax acreage to those districts which are adaptable to a late winter or early spring planting. In the opinion of this Department, those districts are as follows:—

Central and South Gippsland, represented mainly by Berwick, Koo-wee-rup, Drouin, Warragul, Neerim, Narracan, Thorpdale, Mirboo, Korumburra, Poowong, and Leongatha.

The Central Highlands, represented by Trentham, Daylesford, Dean, and Newlyn.

The North-Eastern river valleys, more particularly the upper reaches of the Buffalo, Kiewa, King, and Ovens rivers and tributaries.

At the time at which the appeal was launched Victoria had on hand, or in sight, enough seed to plant approximately 2,500 acres, in addition to the 6,000 acres that already had been planned. Within the first week of the appeal this seed was allocated to the districts around Hamilton, Ballarat, and Riddell, which were regarded as being best suited to a planting at that particular date. The immediate response of farmers to the appeal was so great that we could have allocated double or treble this amount of seed for an early planting, had there been stocks on hand.

The response of farmers right throughout the State has been magnificent. To many of the offers received, it is impossible to give a definite answer until all applications have been examined and the distribution of seed grouped in the most economic manner. To farmers whose offers of help have not been definitely accepted or rejected within a few days of application, we appeal for a generous degree of toleration. It is hoped to place this seed to the best possible advantage which means that decisions on doubtful propositions must be delayed until the desired acreage is absolutely assured. One of the greatest problems is that associated with freight or cartage. Many farmers with suitable properties in more or less isolated areas have offered their services but we hesitate to accept them because of the inevitable high cost of cartage to the nearest flax mill or projected flax mill site. Although inevitably some sacrifice will be involved such farmers are asked to let their offers stand as long as possible.

At the first opportunity, areas offered as flax-growing propositions will be inspected by departmental officers or their deputies and the farmer advised of the decisions reached. If the area is considered suitable the farmer will be asked to sign a contract to grow for and deliver flax to the Department of Supply and Development. Briefly the basis of the contract is as follows.

The farmer undertakes to grow a certain area of flax and to sell the whole of the resultant undeseeded crop to the Commonwealth. The grower shall be paid £5 per ton for flax which is 30 inches in length. It must be reasonably straight, fine, and undamaged straw of fair average quality. In addition, it must carry the fully matured, natural head of undamaged seed and be reasonably free from weeds and other foreign matter. The crop must be harvested as instructed and delivered securely tied in sheaves with binder twine after proper drying by stooking. For crops of better than standard quality, premiums of up to £1 per ton may be recommended.

The Commonwealth guarantees to the farmer a minimum gross return of £4 10s. *per acre* for the flax sown by him providing all farming operations have been performed satisfactorily. Seed will be provided at 15s. per bushel of 56 lb., the cost of such seed and any freight on it will be deducted from the crop cheque. Surplus seed, if any, must be returned and will be credited.

Land offered for the cultivation of flax will be inspected by representatives of the Commonwealth who may reject such land if they consider it unsuitable. The farmer must sow only the seed supplied by the Commonwealth. He will, at his own expense, provide manure, and

Harvesting a crop of Liral Crown flax at Birregurra with a 10 ft. power take off binder.

cultivate, harvest, stook, and deliver the crop according to the Commonwealth's instructions. The resultant crop is to be delivered by the farmer to the Commonwealth's mill or in trucks at the siding nearest the mill. Payments, which shall be on the basis of weight of dry straw only, are to be made in cash within fourteen days of the final delivery to the mill.

It is probable that at the end of this drive, Victoria will have planted approximately 13,000 acres to flax and Tasmania about 7,000 acres, with a small area in Western Australia. Victoria's area will comprise 6,000 acres grown under contract to Flax Fibres Pty. Ltd., and 7,000 acres grown under contract to the Department of Supply and Development. The purchase price to be paid for straw is the same in both agreements.

The salient factors in the production of flax may be summarized as follows:—

Flax for fibre is grown in much the same way as oats for hay

Flax should be grown only under contract to a recognized flax milling company or the Government.

Flax grows well in the moister areas of the State, e.g., Gippsland and parts of the Western, Central, and North-eastern Districts.

Flax must be grown in rotation to avoid "flax wilt."

Flax needs a fine tilth, shallow mulch, and even seed bed.

Early ploughing and thorough cultivation, especially in districts where pea mite is prevalent, are essential.

Flax seed is normally sown at 70 lb. per acre during June, with 1 cwt. of superphosphate. It must be broadcast or drilled shallowly to ensure satisfactory germination.

A leaflet dealing with the sowing of flax for fibre may be obtained free on application to the Director, Department of Agriculture, Melbourne, C.2.

Fertilizers Act

Prosecution for Offence

On the 11th June, 1940, at the Echuca Court of Petty Sessions, before Mr. E. J. E. Nicolas, P.M., a fine of £10, with £5 9s. 6d. costs, was imposed on Mr. B. A. Thomas, fertilizer manufacturer, of Echuca East, for an infringement of section 44 of the Act, which requires the annual registration of a brand for a fertilizer intended for sale. The evidence disclosed that there was not any suggestion of adulteration or inferior quality in connexion with the fertilizer.

Fertilizing Citrus Trees

Tests with Washington Navel Oranges

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor, and C. E. Cole, B.Agr.Sc., Horticultural Research Officer

DURING 1934 a start was made on the rather stupendous task of finding the best manurial treatment for Washington navel oranges growing on the Murray River sands of Mildura. So slowly are the fruiting habits of orchards trees affected by manuring that it is only now that the first results can be set out confidently. This slowness of response is a feature of all such trials, and it should be taken as a warning by those growers who, because they do not obtain an immediate response from a single application of a fertilizer, reject it as useless. The effects of manures can only be judged over long years by careful observation and accurate recording.

Captain D. B. Halhed pruning his Washington Navel orange trees.

This particular experiment was established on the grove of Captain D. B. Halhed at Merbein, where a block of 22-year-old navels on Citronelle (Rough Lemon) rootstock, ranging from perfect trees to trees slightly affected by salt, was made available. These trees are planted 24 feet apart or approximately 77 per acre. As a beginning, the health and yield of each tree in the block was recorded and entered on a plan. On this plan 25 plots, each of five trees, were marked out so as to avoid exceptional trees, and in such a way that each plot was separated from its neighbour by at least one "guard" row. The yield figures obtained at this time, previously to which the block had been manured well and uniformly, served as a measure of the fruiting capacity of each tree, and as a basis on which to estimate the behaviour of the trees under differing treatment.

Soon after the harvest of July, 1935, the first manurial dressings of the experiment were applied. Five treatments were used, namely:—

1.—No fertilizers.
2.—8 lb. sulphate of ammonia per tree (i.e. 5½ cwt. per acre).
3.—8 lb. sulphate of ammonia, plus 8 lb. superphosphate per tree.
4.—8 lb. sulphate of ammonia, plus 4 lb. sulphate of potash per tree.
5.—8 lb. sulphate of ammonia, plus 8 lb. superphosphate plus 4 lb. sulphate of potash per tree.

The importance of nitrogen was so well known that it was included in each treatment except the check plots. Each treatment was allotted five plots, and the five treatments were distributed over the 25 plots in such a way that it was possible to distinguish between

Clock-face scales used for weighing fruit from plot trees.

differences brought about by the treatments and differences due to variations in the soil and in tree health.

Throughout the experiment, grove practices other than manuring—irrigation, green cropping, pruning, fumigation, and spraying—were maintained uniformly at a high standard. The neglect of any one of these can result in far more drastic reductions in yield and quality than the neglect of manuring.

Each July the various fertilizer treatments were applied, and at each harvest the weight of fruit picked from each plot tree was recorded. The yields in 1936 and 1937 showed no differences due to manurial treatment, although in the latter year the trees in the unmanured plots were obviously less healthy than they had been. Their leaves were becoming smaller and yellow-green, and the amount of dead wood increased in spite of regular pruning.

In 1938 this decline in health was even more marked, and took its toll of the fruit. The first differences in yield due to manurial treatment were obtained. More correctly, the difference was due to *lack* of manurial treatment, for it was the result of the failing health of the unmanured plots. All the plots receiving nitrogen, in the form of sulphate of ammonia, yielded more fruit than the unmanured plots. The plots receiving potash and/or superphosphate in addition to nitrogen did not yield any significantly greater amount of fruit than the "nitrogen-only" plots. The difference was entirely due to nitrogen. The yields for the various treatments in 1938, adjusted according to the yields of the same plots in 1935 before the treatments were applied, are set out below.

Average Yield from 25 Washington Navel Trees at Merbein, 1938.

Manurial Treatment.	Av. yield per tree. lb.
Unmanured	317
8 lb. sulphate of ammonia per tree	441
8 lb. sulphate of ammonia + 8 lb. superphosphate per tree	432
8 lb. sulphate of ammonia + 4 lb. sulphate of potash per tree	466
8 lb. sulphate of ammonia + 8 lb. superphosphate + 8 lb. potash per tree	441

The average yield of all the trees receiving nitrogen was 445 lb., which is 128 lb. higher than that of the unmanured trees. This is equivalent to an increase of 246 bushels per acre for the grove concerned. As this increase was produced at no extra overhead cost, its value on the tree may be regarded as the return from the nitrogen applied. The average value of Washington navel oranges on the tree for 1937, 1938, and 1939 was 6s. per bushel. The extra return per acre due to 5½ cwt. of sulphate of ammonia was therefore £73 16s., which, of course, is more than four times the cost of the fertilizer used during the three years necessary to produce this difference. In addition, the rapid deterioration of the unmanured trees must be taken into account.

Quality of fruit was not forgotten. Samples were taken from each plot in 1938, examined closely for external quality differences, and then submitted to the Agricultural Research Chemist for analysis. The following characters were examined:—Colour; rind texture; rind thickness; percentage of juice; percentage of rind; percentage of rag; acidity (acid test); solids-acid ratio; and brix reading (sugars, &c.). The fruit from the various treatments did not differ significantly in any one of these characters. It may be assumed safely that no

quality differences had developed during the three years of the trial.

A storage trial, too, was carried out with oranges from the plots. Twenty-two cases from unmanured trees and 72 from trees receiving 8 lb. of sulphate of ammonia were kept for eight weeks in cold storage. At the end of this time wastage was not significantly greater in one lot than in the other, although there was a tendency to greater wastage in the fruit from the unmanured trees.

This, then, was the first stage of the experiment. The conclusions we may draw are—

(1) that manuring with 8 lb. of sulphate of ammonia per tree is profitable, and does not affect the quality or storage possibilities of the fruit;

(2) that an inadequate supply of nitrogen results in deterioration of citrus trees and reduced yields;

(3) that in three years superphosphate and potash have had no effect on yield or quality. (This soil type usually contains a high percentage of potash(1) but phosphoric acid is generally low. On this property, however, past fertilizing practice included heavy applications of superphosphate, and no doubt the residual effect of this fertilizer is still present. In addition, superphosphate at the rate of 2 cwt. per acre has been applied regularly with green manure sowing.)

Spring-tooth cultivating after irrigation on the experimental plot.

The profitability of nitrogenous manuring for citrus is well recognized, and the experiment provides ample confirmation. It would have been desirable, from some aspects, to carry on the experiment to check up the other conclusions, but the decline in the health of the unmanured trees was so marked that it became necessary to apply nitrogen to them. The experiment has now been altered so that three different dressings of nitrogen—6, 8, and 12 lb. of sulphate of ammonia—are applied within each plot of five trees. The plots continue to receive the same dressings of superphosphate and potash as they did formerly. So now it is possible to find the most profitable amount of nitrogen to apply, to compare superphosphate and potash, separately or together, with nitrogen only, and to discover how the different rates of nitrogen affect the response to the other two fertilizers.

Ploughing under a tick bean cover crop on the fertilizer plots.

(Continued on page 350.

Rochester Pasture Competition

Results for 1939-40

Report of the Judge, A. Morgan, B.Agr.Sc., Irrigation Field Officer

THE most noticeable feature of the irrigated pastures entered in the 1939-40 competition conducted by the Rochester Agricultural and Pastoral Society was the marked deterioration which had occurred between the first and second judgings. The first inspection was commenced on 13th November, 1939, and the second was made on the 19th and 20th February, 1940. Possible causes of the general falling-off in appearance are an interesting field for speculation, but before attempting an analysis it must be pointed out that two distinct types of "permanent" pasture are typical of this district and other closer settlement irrigation districts in the north; superficially, these types react very differently to the stress of summer.

A portion of the winning pasture entered by Mr. H. A. Schier.

In dry seasons, paddocks, in which paspalum (*P. dilatatum*) is associated with white clover or strawberry clover, seem to stand out to advantage in late summer in comparison with the standard permanent pasture mixture with perennial rye-grass and cocksfoot as the main grasses. In some respects the proper management (by grazing) of the paspalum type is opposite that best suited to the rye-grass type, and the influence of management might with justice be regarded as the deciding factor in the superiority of the former in February.

There is another point which favours the paspalum type, and that is, the history of the paddock in relation to lucerne stands of other days. A large number of the paspalum-and-clover swards, which are now returning wonderful summer grazing, under good top-dressing with superphosphate, developed on the best lucerne-growing land. On the other hand, rye grass and cocksfoot have since been sown on less favorable soils, and these pastures have some leeway to make up in regard to fertility, both natural and induced.

Paspalum occurred to a varying extent in the pastures exhibited by six of the competitors, but only one exhibit was paspalum-dominant. In the others, perennial rye-grass was the principal grass. In view of this distribution, one may be excused for confining the discussion to the standard mixture. It is sufficient to remark that the paspalum tends to get beyond control in the late summer. This provided the inspiration for an opinion expressed at the annual field day, that "the more you flog it the better it gets." As a principle of pasture management, this attitude fails to take into account the real source of high production in the average "paspalum pasture," namely, its clover content, either white clover or strawberry clover. From the production viewpoint the name "paspalum pasture" is a misnomer. It is significant that paspalum became of great value to the dairymen only after the practice of topdressing produced strong clover growth in it. To apply a haphazard grazing management to these pastures may give "good enough" results on old-established paddocks, but does it produce the best results? It will not give the best results with the standard mixture.

The pasture, entered by Mr. J. Fehring, which gained second place.

Where the acreage of established pasture is a high proportion of the holding, and the labour problems of dairying ensure that the number of head of stock maintained is kept below the maximum possible carrying capacity, then rough management does little damage of a permanent nature. But where a block is being built up gradually by establishing sown pasture, care is very necessary. Rotational grazing in some form then becomes a vital factor in lifting the production of butter-fat per acre, which, as Mr. H. A. Schier remarked at the field day luncheon, is the truest measure of success in dairying.

Our observations show that owners of paddocks of the standard mixture are either advocates of controlled grazing, or their pastures are in a backward state. It is even more difficult for the sheep-man. To him, controlled grazing too often means that little more than the roots of the plants are left when the sheep leave, and this system is even more detrimental to the clovers in the first years of a pasture.

In regard to the majority of the exhibits, it is only fair to say that the deterioration referred to also had its origin in part in factors other than faulty grazing management. Looking back over the conditions for pasture growth from February, 1939, to February, 1940, the outstanding features were the acute water-shortage up to the end of February, 1939, and the extended series of rains which lasted through to the following late spring. Both affected clover growth. The revival of clover from the drought was remarkable, but some loss was inevitable, and in many fields it was exaggerated by late cutting for hay. The grass grew at the expense of the clover.

The extent to which a long period of grass growth can influence the proportion of clover in a pasture has been shown in tests at Werribee. A full report of the trials has been given in this Journal (February, 1936), and it is sufficient to say that a rye-grass-cocksfoot-white clover pasture reacts most favorably—in production, botanical composition, and feeding quality—to a system of grazing at intervals of about one month. Cutting for hay depresses the clover, and if this operation be done late in the season, as was unavoidable last spring, the results are likely to be apparent throughout the following summer.

Two or three days are sufficient to allow for each grazing. In departing from this rule the welfare of the clover is almost always adversely affected. Exceptions are those paddocks where clover percentage is very high, and the strain present is very vigorous, as it is in some paddocks where it has appeared as a volunteer and spread with the sole assistance of water and manure. A survey of this type of paddock in the north shows that this very fortunate occurrence is limited to soils which show a good penetration of irrigation water or possess some special advantage such as a self-mulching ("loose-top") character. In all other cases, where good results are being obtained in situations originally less kindly, attention to all the details of grazing, manuring, and watering is evident.

Rusty perennial rye-grass was prevalent in the exhibits, and can scarcely be accounted for on the basis of the weather conditions since spring. The absence of rainfall and prevalence of wind have been conditions directly opposed to those usually associated with outbreaks of rust. It seems that rust can be a symptom of senility of the leaves, and that the relative unpalatability of the rye-grass as compared with cocksfoot and clovers is the cause of the rye-grass leaves maturing to the stage at which they become subject to rust under irrigation.

The Awards.

Mr. H. A. Schier's permanent pasture, showing a good mixture of perennial rye-grass, cocksfoot, and white clover, secured the highest points at both inspections. The paddock is one of approximately 7 acres which was sown with a mixture of 8 lb. Hawke's Bay perennial

rye-grass, 3 lb. Italian rye-grass, 3 lb. cocksfoot (New Zealand Akaroa), 1 lb. New Zealand wild white clover, 1 lb. white Dutch clover, 1 lb. alsike, and 1 lb. lucerne per acre. A bag of superphosphate was used per acre at seeding, the following season it received two bags per acre, and in the 1937-38 season the dressing was three bags per acre. Three bags per acre was applied in March, 1939.

This field has been inspected on other occasions, and has previously been a prizewinner. A continuous improvement has been observed. Clovers have become firmly established but have not been allowed to upset the balance of legumes to grass in spite of the liberal topdressing. Cocksfoot, a grass which, because of its slow growth, has had to fight a considerable amount of prejudice in northern districts, has steadily become more prominent as the plants have attained their full size.

The paddock is regularly grazed by a high-producing herd, the usual practice being to feed it off for one week in four. In the 1937-38 season sheep were also carried in addition to 60 to 70 cows, and five grazings with the sheep were allowed as follows:—150 sheep for three days (two occasions), 300 for three days (twice), and 240 for five days (once). The figures quoted show that the paddock has been a "show" exhibit in performance as well as in its appearance at judging times.

Luxuriant irrigation wild white clover on the property of Mr. W. Semple.

A clean channel and a low weed-content were also notable features. Of the few weeds present, hedge mustard, soft brome grass, spear thistle, and dock were the main species. Layout is in half-chain bays, and although no special drain has been provided the results achieved show that this factor has been attended to by careful use of the water.

Second place was awarded to Mr. Fehring with a total only two points below that of Mr. Schier. The pasture is three years old, and consists of a mixture of white clover, strawberry clover, and perennial rye-grass. A few plants of alsike and cowgrass still persist from the original seeding, the quantities of which could not be supplied by the exhibitor. Other components were subterranean clover and odd plants of lucerne. Weeds present were shepherd's purse, rib grass, flatweed, dandelion, dock, and spear thistle. Topdressing has been at the rate of a bag per acre each year.

The soil here is of superior quality for pasture growth, being the silty material which characterizes the best ridges. It has been noted that this soil responds well to topdressing, and grows white clover exceptionally well. It also grows dandelion and couch grass to perfection, and heavy topdressing is desirable to keep these in check by encouraging the clover.

A heavy cut of meadow hay on Mr. W. Semple's property.

The subterranean clover in this paddock, and also in others inspected, proved to belong to two distinct strains. This was more obvious at the spring judging, when flowers were present. As the subterranean clover sown in early years was practically all Mount Barker mid-season strain, which has a bright red colouration at the base of each flower, the presence of later-maturing plants with no red colour on the flowers suggested that some of the Tallarook late strain had found its way into the paddocks. Later, inquiries addressed to Miss Y. Aitken, M.Agr.Sc., who has carried out research on these strains at the Melbourne University School of Agriculture, indicated that the strain noticed was equivalent to Bass, a Gippsland strain which is about a fortnight later than Tallarook. Supplies of this seed are not available in commercial quantities. Apparently the summer waterings and manuring practice at Rochester have favoured the development of this late strain, which serves a very useful purpose in providing winter feed of a nutritious and palatable kind.

Mr. Fehring had adopted the border system of layout, with half-chain bays, and the channel was clean. No provision for economy of labour in watering, by the use of permanent outlets of concrete, piping, or wood had been made, but this aspect is receiving the full attention of many irrigators.

Third prize was shared by Messrs. J. Huon and Firth Bros. Space does not permit a detailed account of these pastures, but the provision of pipe outlets in the former, and concrete stops in the latter, is worthy of note. Both exhibits were laid out on the border system with narrow bays and short runs, and consisted of the permanent pasture mixture brought up to a high standard by regular top-dressing.

ROCHESTER PASTURE COMPETITION, 1939-40.—LIST OF AWARDS (TWO INSPECTIONS).

Exhibitor.	Layout and Condition of Channel.	Mixture.	Condition.	Uniformity.	Freedom from Weeds.	Total.	Grand Total.
Possible Points	20	20	20	20	20	100	200
H. A. Schier	19 19	19 19½	18½ 18	19 19	19½ 19	95 94½	189½
J. Fehring	19½ 19½	17 18	19 19	19½ 19½	19 17½	94 93½	187½
J. Huon (No. 1)	19½ 19	18½ 18	15 19	19 19	19 18½	93 91½	184½
Firth Bros.	19 19	19 19	17½ 18	18 19	18 18	91½ 93	184½
E. Gorman	19 19	19 19	14 18	19 18½	19½ 18	90½ 92½	183
J. Huon (No. 3)	18 18	18 18	18½ 18	19 19	19 17	92½ 90	182½
A. W. Glass (No. 2)	19 19	18 18	17 18½	19 16	19 18½	92 90	182
W. Semple (No. 1)	18½ 18	19½ 17	18½ 17	18½ 18½	19½ 17	94½ 87½	182
W. Semple (No. 2)	18½ 18	18 17	18 17	18½ 19	19½ 16	92½ 87	179½
A. W. Glass (No. 1)	18 18	19 18	19 17½	17½ 18½	17 17	90½ 89	179½
A. W. Glass (No. 3)	17 17	18 17½	17 18	19 17½	19 16½	90 86½	176½

(Results of spring inspection given first in each case.)

The well kept pasture plots at the Ballendella State School.

Points for Exhibitors.

For the guidance of exhibitors, the following notes deal with the features which carry a pasture into the prize-winning class. Preference is given to fields laid out on the border system with bays not exceeding 1 chain in width and 10 to 12 chains in length. Channels should be free from weeds, showing that efficient watering can be carried out. Provision of permanent structures for outlets and stops promotes higher efficiency, and gains extra points.

In the points allotted for mixture, the degree of development of the perennial legumes, especially white and strawberry clovers, and the perennial grasses (particularly perennial rye-grass and cocksfoot) is considered, and adjustment is made for a desirable balance between them. Condition is important at judging, and it is here that many excellent pastures lose points at the spring inspection. The object of the exhibitor should be to show a field in a suitable state for grazing, not for meadow hay, and a great bulk of rank grass will fail in comparison with a fresh growth of up to 5 or 6 inches in height. Uniformity refers to the absence of rank patches, drowned-out or dry patches, &c., and is a check on the grading and grazing management.

In conclusion, it seems desirable that the permanent pasture paddocks and the paspalum-clover paddocks should be entered in separate sections for judging, and a prize for the best *new* pasture might assist in stimulating development.

School Plots.

A point brought up during the judging of the section for school plots was the need of standardization. Various judges have officiated, and their opinions have differed in some respects. The inclusion of strains of subterranean clover is a case in point. For this season's competition, the inclusion of the Dwalganup (early), Mount Barker (mid-season), and Tallarook (late) strains has been considered a desirable feature, whereas in other judgings preference has been given to exhibits featuring distinct species of fodder plants. One result has been that species of very minor importance either under irrigation or under natural conditions have been introduced into the exhibits, and there appears to be very little gain to the young farmers in continuing the practice. Subterranean clover has proved so valuable in Victorian grass-farming that the inclusion of the three main commercial strains, to illustrate to students the characters which fit them for certain types of pasture, seems a wise move.

For consideration by the Agricultural Society, the suggestion is put that a list of twelve species and strains be required to be grown for the competition. A suggested list is: *Legumes*—Irrigation wild white clover (certified Dingee strain), certified New Zealand wild white clover, Palestine strawberry clover, cow-grass, alsike clover, subterranean clover (three strains—Dwalganup, Mount Barker, and Tallarook, or Bacchus Marsh, Mount Barker, Tallarook), and lucerne. *Grasses:* Perennial rye-grass (two strains—one Victorian and the other New Zealand Hawke's Bay), cocksfoot (certified Victorian). If desired, additional species such as prairie grass, Phalaris, kikuyu, Rhodes grass, Kentucky blue-grass, paspalum, &c., could be grown but not entered in the competition.

The Ballendella school (Headmaster, Mr. Weppner) scored highest aggregate points. In this exhibit there are 21 boxes in a strongly-fenced white-painted enclosure which harmonizes very well with the rose garden and lawns which have been established at the

School Plots.—Rochester Competition, 1939-40.

School.	Species.	Paths, &c.	Labelling.	Freedom from Weeds.	Condition.	Total.	Grand Total.
Possible Points	20	20	20	20	20	100	200
Ballendella	18½ 19½	19½ 19½	19½ 19½	19 19½	17 19	93½ 97	190½
Nanneella Estate	18 19	18 19½	19 19	19 19½	19½ 19½	93½ 96½	190
Nanneella South	19½ 18½	16 19	19½ 19½	19 19½	18½ 18½	92½ 95	187½
Nanneella West	18 16	18 19	18 18	18½ 19	19½ 18½	92 90½	182½

(Results of spring inspection given first in each case.)

entrance gates. The boxes are sunk in the ground, with the exposed edges painted white, and separated by gravelled paths kept free from weeds.

The species represented in the boxes make an imposing list: White clover, strawberry clover, New Zealand white clover, alsike, cow grass, wild white clover, Palestine strawberry clover, Mount Barker subterranean clover, Bokhara clover, berseem, lucerne, Lotus major, Colac perennial rye-grass, prairie grass, kikuyu grass, Rhodes grass, cocksfoot, timothy meadow fescue, rough-stalked meadow grass, *Phalaris tuberosa,* and Wimmera rye-grass. The botanical names of these, correctly spelt, are displayed in neat lettering on painted labels. Weeds have been carefully picked out, and although some points were lost for condition at the spring inspection this defect was not noted at the autumn visit.

Question and Answer

The following question has been received from a correspondent and it is considered that the reply will be of general interest.

QUESTION.—"Oat-tired" of Yambuk asks what climate and means are necessary for growing broom millet. What is the usual time for sowing, the price of seed, and how is it harvested?

ANSWER.—Climatic conditions suitable for maize are regarded as suited to broom millet, although millet will tolerate perhaps a lower degree of atmospheric humidity than maize. In actual fact broom millet in Victoria is confined to the Ovens and King River Valley areas in the north-east where it is grown on rich alluvial soils, and to the Murrabit area in the northern district where it is grown under irrigation. There has been practically no commercial production of broom millet south of the Divide. Yambuk is not regarded as a very suitable area.

The fibre is hand cut with a heavy butcher's knife or similar implement, by removing the seed head from 4 to 10 inches below the point at which the panicles or seed carrying fibres join the main stem. The length of the "handle" varies with the length of the fibre —long fibre carries a short handle, while short fibre carries a long handle.

The heads are tied into small sheaves and left in the paddock, if weather is suitable, until they have partially dried. The sheaves are stacked in a thin layer under cover to complete drying. If left in the weather the fibre loses colour, strength, and value. When the sheaves are thoroughly dry the seed is removed by means of a special thresher.

Seed is sown at the rate of 2½ lb. per acre, usually in November. Small lots of seed should not cost more than 6d. per lb. Large quantities could be obtained at a lower figure.

Their Establishment, Maintenance and Renovation

By F. R. Drake, B.Agr. Sc., Assistant Agrostologist

AS the lawn is intended to be a permanent feature of a garden, thorough preparation of the ground before sowing or planting is most important. No deficiencies in the manner of preparing the ground before planting can be remedied subsequently without great inconvenience and heavy expense. Of the many causes of failure or poor results, the following are the most important:—1. Poor soil preparation. 2. Sowing at an unfavorable time of the year. 3. Sowing grasses which are not true turf-forming plants. 4. Sowing seed of poor quality—that is, of low germination or containing many weed seeds. 5. Incorrect manurial treatment.

Preparing the ground.

In considering the preparation of an area of ground which is to be planted with lawn, one must take into account the nature of the soil, the amount of levelling to be done, and the weed population present. As regards soil, one is usually restricted to the soil naturally occurring. From the points of view of cost of preparing the ground, and ease of planting and maintenance of the established lawn, sandy soils are the most desirable. A satisfactory garden lawn can be established, however, on almost any type of soil, provided it is topsoil and not subsoil, and provided it is correctly prepared for sowing. On very heavy soils the incorporation of some sandy soil is desirable, but the bringing-in of any large quantity of outside soil adds greatly to the expense of the undertaking. For areas that are to be used for playing, such as golf and bowling greens, the use of a lighter soil is essential, to maintain a clean, dry and firm playing surface.

In preparing the ground for a lawn, deep cultivation of the soil before seeding is not necessary. What is essential, however, is very thorough cultivation of the top 4 to 6 inches of soil to produce a very fine tilth. If the ground is infested with creeping weeds it must be dug over to at least the depth to which the runners penetrate, and all runners cleaned out. After the first digging, the ground should not again be disturbed deeply, but allowed to settle and consolidate. The surface few inches should be cultivated regularly to destroy weeds as they germinate and to prepare a very finely divided surface soil in which to sow the seed.

If the area requires more levelling than can be done by filling with topsoil, it will be necessary to remove the topsoil altogether, adjust the levels by moving the subsoil, and then replace

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the topsoil. Unless this is done, portion of the lawn will be sown on the subsoil exposed during levelling, and such parts will always be unsatisfactory and specially liable to burn out during the summer.

Having levelled the area and cleaned out all the runners of creeping weeds, one should not be in too great a hurry to sow the seed. The longer the area can be fallowed, the more weed seeds will be germinated and killed by cultivation. Also time is necessary to allow the ground to settle properly, to make final adjustments in the levels and to prepare a really fine seed bed. More time is required to get a heavy soil into satisfactory condition for sowing than is needed for a sandy soil.

Sowing the Seed.

We have seen that the ground to be sown should be reduced to a very fine tilth. Most lawn seeds are very small and could not be expected to succeed if sown on a rough, cloddy seed bed. Further, this very small seed will not germinate if buried too deeply. The usual method is to broadcast the seed on the surface by hand, and cover by means of a very light raking. The seeding rate is usually about 1 oz. to the square yard, and in order to facilitate even spreading, the seed is best bulked up with a quantity of dry sand or, if obtainable, sawdust. The mixture of sand or sawdust and seed should be divided into two equal parts and the area gone over twice, in different directions.

The time of sowing is not always under the control of the person doing the job, but where possible lawns should be sown in the early autumn, with early spring as second choice. Winter sowings are slow to establish, and at this time of the year weeds are likely to grow much faster than the grass.

Choice of Grasses.

Ornamental lawns and areas of turf used for sport are often very different, not only as regards their botanical composition, but in the methods required for their successful maintenance. It is proposed to deal with each of the more important grasses in turn, and to discuss its suitability or otherwise for each purpose.

To most people an area of turf is either buffalo, couch, or "English grass," the last term being used vaguely to cover any miscellaneous collection of grasses and clovers other than the first two. **Buffalo,** at one time the standard lawn grass around Melbourne, is rapidly losing popularity. As a lawn grass it has quite a lot to recommend it, being vigorous and drought resistant and making a dense and attractive summer lawn. However, it provides a nice lawn during the summer only and is brown and dormant during the winter. With increasing age, buffalo tends to become very spongy, especially on banks, and therefore difficult to mow. Buffalo does not stand really hard wear, and this fact coupled with its tendency to become spongy, rules it out as a grass for playing fields of any kind. It does best in sandy soils and in coastal districts, where frosts are less severe than they are inland.

Couch grass, on the other hand, is a grass which has maintained its popularity and will almost certainly continue to hold an important place, particularly for recreational areas. In one way it resembles buffalo—in being a summer grower, with a completely dormant phase during the winter. It is even more drought-resistant than buffalo, is extremely hard wearing, and makes a fine-leaved, close, and firm turf which is infinitely superior, for sporting purposes, to that formed by buffalo. Considered as a lawn grass, couch is losing favour around Melbourne because of its poor winter appearance, but for the harder and drier conditions inland it maintains its supremacy.

For certain classes of sports turf, the good qualities of couch grass outweigh its shortcomings, and for heavy duty work in the sporting field it is unsurpassed. Its special uses are for tennis courts and golf fairways and for large-scale lawns where water is limited. Couch grass is so completely dormant in the winter that various volunteer annual plants are able to grow through it, thus preserving the colour of the turf and making it attractive to play on at that time. The growth of these winter grasses is of special importance on golf fairways, and here the common *Poa annua* or winter grass is the most useful.

The so called "English grasses" are, of course, many and varied, and include perennial rye-grass, crested dogstail, Kentucky blue grass, Chewing's fescue (and other fescues), and the various bents such as brown top, red top, and the creeping or stoloniferous bents. *Poa annua*, mentioned as a common volunteer in couch lawns, is often present in large amounts in lawns of the English grass type.

The commonest ingredient of most lawn mixtures is **perennial rye-grass.** Rye-grass is a strong-growing plant with shiny leaves of medium width and is a tough grass to mow. It forms a fairly good, hard-wearing turf of good colour

Variety trials with lawn grasses at Burnley.

on fertile soils, but is not a turf forming grass in the true sense of the word in that it will not stand constant, keen mowing for any length of time. If grown as single plants, rye-grass becomes tufted and shows no tendency to creep. To obtain a turf of any density and to avoid tuftiness a heavy sowing of seed is necessary. Perennial rye-grass may therefore be regarded as definitely a second rate lawn grass, suitable particularly for large scale work where the quality of the turf must take second place to considerations of cost of establishment and maintenance.

Unquestionably the most attractive type of lawn is one consisting solely of grasses, but on large areas the maintenance of a pure grass sward entails considerable expense and constant vigilance and treatment. Under such conditions a mixed sward of rye-grass with white clover and perhaps suckling clover is the most practical, and not at all unattractive, type of lawn. The presence of clover in such a sward maintains a colour in the turf and a healthy growth of the grass which can be achieved in a pure grass sward only by frequent manurial treatment. Rye-grass is a plant which is very competitive with other grasses, and where it is sown the finer grasses, such as the fescues and brown top, have little chance to compete successfully.

The best kind of rye-grass for lawns is the New Zealand certified type, the plants of this variety being dense and leafy with moderately short, upright leaves. Irish rye, although much advocated for this purpose, is smaller, less vigorous, and shorter lived under our conditions. A virtue of rye-grass, and the reason for its popularity in ready-made seeds mixtures, is the rate at which it establishes and forms a presentable looking turf from seed. Rye-grass areas which have become sparse and tufty as a result of the plants thinning out can be renovated by raking or harrowing and reseeding.

The second grass mentioned in the "English grass" list, **crested dogstail,** does not appear to have any value as a lawn grass under Victorian conditions, and is mentioned only because it is so often included in seeds mixtures for lawns. It is a comparatively short lived plant with rather broad leaves and a non turf-forming, lax habit of growth.

Kentucky blue grass is a plant which occupies an "in-between" place in the scale of lawn grasses. By itself it makes a somewhat sparse turf, but it spreads by means of long, slender, underground runners (rhizomes) and appears to be able to mix well with other grasses and to fill in any gaps which may occur. It also blends quite well with buffalo and couch and thus may help to improve the winter colour of lawns of this type. It is fairly resistant to dry conditions, a fact which gives it an added value.

The remaining grasses, the bent grasses and the fescues are the real fine-turf forming

grasses, although in this respect the different bents vary very conspicuously. The fescue family includes many species and varieties, but for practical purposes in Victoria only one kind known as Chewing's fescue need be considered. The seed used in Victoria comes principally from New Zealand, where the grass is used to some extent for grazing, but is cultivated mainly for seed production.

Chewing's fescue is a very fine-leaved grass, producing numerous erect-growing leaves. It produces a very dense, fine-textured lawn, but the plants are not always long lived, and for this reason pure sowings of Chewing's fescue are not recommended. Its special virtue is its ability to blend with the bent grasses. Its crisp, erect leaves act like the pile of a carpet, and give the lawn density and depth. If good quality seed be obtained Chewing's fescue will establish rapidly from seed. The seeds are fairly large, but the seedlings are not strongly competitive like those of rye-grass and act as a good nurse crop for the smaller bent seedlings.

The bent grass family includes many species and varieties the classification of which is difficult. For the purpose of this article only common names will be used and the discussion limited to those kinds which are available commercially and are in use for lawn planting. Under favorable conditions most of the bents are aggressive and thoroughly permanent, so that the choice of the variety of bent grass seed to be sown is perhaps the most important factor in the establishment of a high quality lawn.

The most satisfactory and reliable bent grass seed available commercially is New Zealand certified **brown top**—it is certified to be free of red top, a coarse grass which will be mentioned later. Brown top is a semi-tufted plant, without surface creeping runners, but with usually some development of short rhizomes or underground shoots. It produces very numerous new tillers or shoots from below the level of the mower blade and develops under mowing a very dense leafy sward. In colour, brown top is an attractive lightish green, and it is able to withstand continuous close cutting, a character which makes it very valuable for playing greens as well as for lawns. Brown top seed comes principally from New Zealand, where it grows mainly in rather wet areas. It requires an abundant supply of water in the summer to keep it in good condition. It is rapidly and deservedly becoming the standard grass for putting and bowling greens and also for the better class of garden lawn. Although it is customary to mix other grasses, particularly Chewing's fescue, with this species, it has been

Single plants of (left) brown top and (right) red top. Compare the dense multi-tillered habit of brown top with the sparse development of foliage of red top.

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Single plants of the Victorian bents in comparison with New Zealand brown top. Note the more vigorous growth and greater spread of the Victorian grasses (the three left hand rows).

shown that first-class lawns can be established from pure sowings of brown top, the seed of which although so very tiny, germinates and establishes with remarkable vigour.

A different type of bent grass, found in New Zealand and described as **dryland brown top,** is coming to be recognized as a valuable grass for Victorian conditions. This grass has well developed rhizomes and is more able to survive dry conditions than is the ordinary brown top. It may burn off just as badly in hot weather, but the underground runners remain alive and will sprout again with the autumn rains. It is a darker shade of green, sometimes appearing almost greyish, and has narrower leaves than the ordinary brown top, but produces a turf of at least as great a density and quality.

A rather similar type of grass is to be found in many parts of Victoria, around Woodend, Ballarat, and parts of Gippsland, and where available is being used quite successfully for planting lawns and playing greens. In some cases it occurs naturally as the main constituent in certain country golf course fairways. It is a persistent and dense-growing plant with vigorous rhizomes and can be planted by digging up the plants, chopping them up, broadcasting the pieces, and lightly covering them with soil.

The other type of bent grass which is extensively used and frequently simply called "creeping bent," is more properly called **red top** or **florin.** Red top is a very different plant from brown top, although the seeds of the two species are remarkably similar. It is broad leaved, with well developed and stout, but not numerous, rhizomes, which usually come to the surface some distance from the centre of the plant, with the result that red top makes a coarse and open turf and is not naturally a sward forming grass. The seed comes chiefly from America, where it is an important agricultural grass.

It is wrong, therefore, to call red top creeping bent, and such a description leads to its confusion with the third main type of bent grass to be described, the true **creeping bent.** This grass is characterized by having long surface-creeping runners (stolons), which spread over the surface of the ground and intermingle to produce a dense and leafy turf. This type is a rather light seeder, and true creeping bent seed is expensive. If a sample of such seed is sown, the plants produced, when examined individually, show considerable variation from one to another. This fact has led to the selection and propagation vegetatively of single plants of superior merit.

Bent grass varieties do not grow perfectly true from seed, so that special selections must be multiplied by planting pieces of the original plant. Pieces of the runners of this type strike very readily, and a stock for planting can be produced from a single plant in quite a short time. In planting a lawn by the vegetative method, as distinct from the sowing of seed, one may either dibble in pieces of runners over the whole area, or cut up the runners into short lengths, spread this material over the surface, and cover lightly with soil.

[*Continued on page 356.*

The Control of Irrigation Water

Its Efficient Use

Report of the Competitions held by the Rochester, Echuca, Pyramid Hill and Boort Agricultural Societies

By Mr. J. A. Aird, B.Sc., B.Agr.Sc., Dip. Comm., Chief Irrigation Officer of the State Rivers and Water Supply Commission

THE drought of 1937 and 1938, and the consequent shortage of irrigation water during the irrigation season 1938–1939, brought home to irrigators the fact that water supplies are not inexhaustible. With the growing demand for water, as a result of greater pasture production and more intensive farming generally, there will be a tendency for shortages of water to occur more frequently in the future. It is evident, therefore, that efficiency in the use and control of water on the farm will be necessary to enable irrigators to get results from the water available. The expansion of irrigation in New South Wales will also mean that, in the future, less water will be available from the Murray River.

A concrete diversion box at the supply point enables all water coming through the wheel to be readily controlled.

The agricultural societies at Rochester, Echuca, Boort, and Pyramid Hill decided, therefore, that they should do all they could to foster increased efficiency in the use and control of irrigation water in their respective districts. As a step in this direction competitions were organized in each of these centres. At Rochester, Echuca, and Boort they were for the farm with the most efficient system for the use and control of water on the farm, and at Pyramid Hill for the best irrigation farm; points being specially allocated for methods used in the distribution and control of water.

As the competitions at Rochester, Echuca and Boort were the first of their kind in the State it was necessary, at the outset, to fix a scale of points for judging, and the following was decided upon:—General layout and system of distribution of water on the farm, 20; methods of control of water in distribution, e.g., structures, &c., 20; cleanliness and freedom from weeds of irrigation channels, 20; general layout of drainage system, and facilities for it, 15; cleanliness and freedom from weeds of drainage system, 15; and facilities for water supply for stock, 10—making a total of 100 points. It will be noted that 60 points were allotted for irrigation, 30 for drainage, and 10 for stock supplies.

In the Pyramid Hill district the following scale of points, which had been used for irrigation farm competitions in the Rochester district, was adopted:—General layout of ground for irrigation and convenience for handling a dairy herd or sheep, 40; percentage of land under cultivation, 40; returns from dairy herd, and general appearance of stock, 30; general control of water, including state of irrigation ditches, 25; conservation of fodders, 22; poultry and pigs, 22; fences, 18; farm buildings, 18; freedom from weeds, 15;

Wooden stops in use on distributary channels in an orchard.

care of implements, 10; and general appearance of immediate surroundings of dwelling, 10.

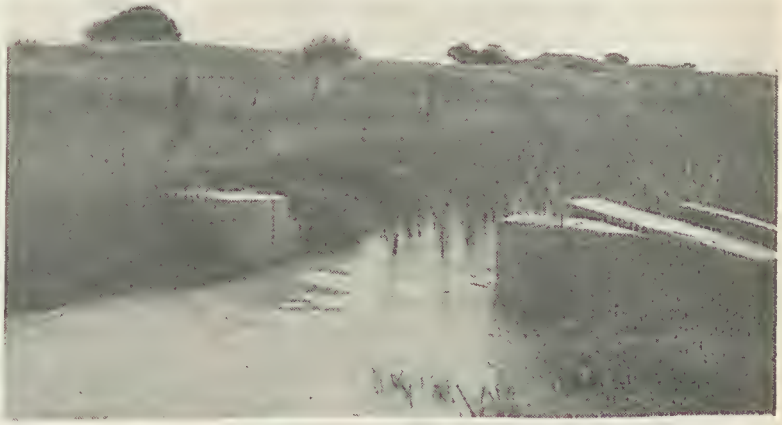
Inspections made at various times have shown that there is plenty of scope for increased efficiency in the use and control of water on irrigation farms. Although the standard of the farms entered in the competitions was higher than that on the average irrigation farm of the respective districts, it was evident that even on these farms the opportunity existed for still further improvement.

Turning to the individual items for which points were given, the general layout and system of distribution of water, in most cases in the Rochester and Echuca districts, had been laid out on satisfactory lines, that is, channels were in their correct positions and the land was graded and checkbanked according to approved methods. On the competition farms in these districts there were no bays in excess of 10 chains in length and 1 chain in width, most of them being about 40 feet wide. Drowned-out patches indicating poor grading were also not conspicuous on any of the farms. On the other hand, however, the channels were frequently too small to carry a reasonable head of water and the rate of irrigation was slow, leading to over-irrigation.

The Pyramid district competition included farms from the Tragowel Plains, in the vicinity of Pyramid itself, and from the Calivil and Dingee districts. In the Tragowel Plains district water rights are allotted only on a basis of 1 acre-foot per 5 acres of suitable commanded land, and a few areas only were set out for perennial pasture and lucerne. The remainder of the irrigated land was used for annual grass crops such as native species, subterranean clover, and Wimmera rye-grass. On these areas what might be termed "rough and ready" methods were in use; that is, bays were long and wide, and the channels were built more with a view to cheapness in cost than to efficiency of service. Although such systems might have advantages from the point of view of economy of time where only one or two irrigations are applied each year, they certainly cause increased cost and loss of efficiency when used for more waterings.

This difference in systems also made it most difficult to judge the farms, as a comparison of two types of culture had to be made. However, the scale of points gave the advantage to the smaller area intensively cultivated, and the place-getters in this competition came from the Dingee and Calivil districts, although some of the farms in the Pyramid district were quite efficient.

The competitions indicated that there are several ways in which the efficiency in the use



Concrete stop in headditch.—This is wide enough to prevent loss of head and scouring. Cumbungi is hindering flow of water and should have been cut.

and control of water on the farms can be increased in the irrigation areas, viz., size and state of channels and channel crossings, structures and outlets, weeds, provision of drains and general efficiency.

Size of Channels.

To carry a reasonable stream of water from the Dethridge wheel on the ordinary grade of, say, half an inch to the chain, a channel at least 3 feet wide on the base, with sides 1:1 or flatter, is required. Such a channel is best made with a scoop. The tendency is to push out a channel with a delver, and to enlarge it with a shovel. This leads to much more hard work. On almost all farms visited in the Boort district the channels were of reasonable size. This cannot be said of the other districts where many channels were seen which, even if they had been moderately clean, would not have taken a stream of more than 1 cubic foot per second, enough to irrigate about 6 acres a day of 24 hours.

In many cases the efficiency of channels was hampered by the type of crossing over the channel. The hollow log, which no doubt is the cheapest, has the disadvantage that the hole through it is seldom large enough to take a good stream, and the nature of the surface of the log also tends to hold up the water. The result is that a loss of head occurs at each such crossing, and it is harder to get the water to the more distant parts of the block, the area commanded is reduced and the period of watering extended. Concrete pipes, unless of a reasonable size—say, 15-in. diameter—have the same disability as the hollow log, and are more expensive. The most suitable type of crossing is a timber bridge which, if supported in the middle, does not need to be built of particularly heavy timber. Such a bridge can be built at reasonable cost from old railway sleepers.

Checks and Stops.

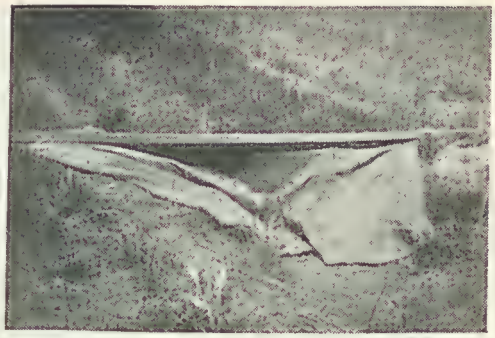
Providing that channels are of reasonable size, and are kept clean, the next essential for efficient control of water is the provision of checks (or stops) to divert the water into the smaller channels, and to back it up while irrigating. In order to be effective stops must be wide enough to obviate restriction or heading, reasonably watertight and easily operated.

A wooden stop of the box type. On account of narrow width, capacity is limited and sheeting is necessary to prevent scouring.

Of the checks seen on the farms in the Rochester, Echuca, and Pyramid districts very few were up to this standard. The standard in the Boort district, however, was much better in this respect. In a number of cases pipes (see photographs), faced with concrete and closed with boards or old discs, were used and were quite effective; but they have the disadvantage that they lack capacity, particularly when the channel is not running full. In addition, they restrict flow and cause a loss of head, with scouring as an inevitable result.

Simple checks of wood or concrete, with wooden or steel doors with a gap at least 3 feet wide, are the cheapest and most efficient type. In lengths of channel which require checking only under special circumstances, or in channels used only for watering cereals or subterranean clover in the spring and autumn, water can be controlled by means of "bag stops."

The simplest form of this type is a sheet made of bags or canvas, fastened to a pole about 10 feet long. This can be improved by placing three ropes down the back and fastening them to the edge, making loops so that the flap can be held in place. A diagram of this type of stop, together with diagrams of a number of irrigation structures, was published in the October, 1939, issue of this Journal, and reprints are available free on application to the State Rivers and Water Supply Commission, or the Department of Agriculture.



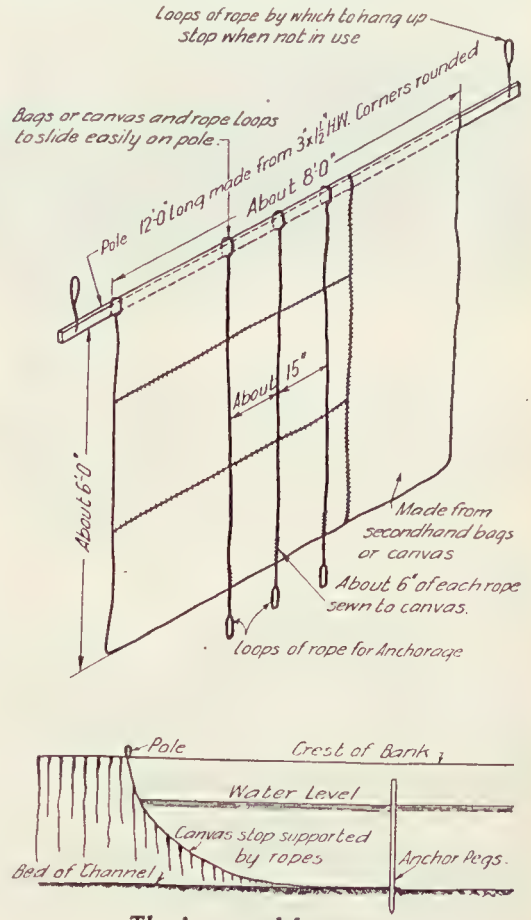
Type of bag stop usually used. Although better than an earth bank it can be easily improved as shown in the following diagram.

A stop made of 12 in. pipe faced with concrete and blocked by plough disc. Small capacity limits use to small channels; on mains head is lost and scouring occurs.

Outlets to Bays.

The usual method of admitting water to bays is by a cut in the channel bank. This has the advantage of being easily made, and of costing nothing at the moment. It has, however, the disadvantage that the earth washes away and has to be replaced. Even then, weak places in the banks are formed, which burst and flood land already irrigated, and are thus liable to cause heavy loss. Some other form of an outlet is therefore advisable.

Among the competing farms the most usual type of outlet was 4-in. or 6-in. earthenware or concrete pipes let through the bank, stopped with a plug, and made watertight with a piece of sacking. Although these are a distinct improvement on the cut they have the same disadvantage as the "pipe check," lack of


Loops of rope by which to hang up stop when not in use
Bags or canvas and rope loops to slide easily on pole.
Pole 12'0" long made from 3"x1½" H.W. Corners rounded
About 8'0"
About 15"
About 6'0"
Made from secondhand bags or canvas
About 6" of each rope sewn to canvas.
Loops of rope for Anchorage
Pole
Crest of Bank
Water Level
Canvas stop supported by ropes
Anchor Pegs.
Bed of Channel

The improved bag stop.

capacity. In addition, in some soils, the water works along the outside of the pipe and, seeping through, causes a break.

A good type of outlet is one about 3 feet wide, made of concrete, 2 inches thick, or red-gum set into the bank with an opening about 18 inches wide and fitted with a plain iron door of about 20 gauge. Where the bays are long and larger heads than normal are being used, larger outlets are necessary, but the above dimensions are quite suitable for the ordinary bay of 40 feet to 60 feet wide and 10 chains in length.

Note the wooden stop out of repair, the bag stop left to rot in the channel, and the channel full of weeds. These conditions are not wanted on an irrigation farm.

Weeds in Channels.

Probably the greatest hindrance to efficient watering, however, is the presence of weeds in channels. Practically all types of vegetation at times grow luxuriously in channels, and coping with them is one of the most serious problems both for the irrigator and the Commission. The best control on the farm is obtained by having channels on such a grade that they can be drained out between each irrigation. This prevents aquatic plants, such as cumbungi and cattail, from becoming established. During the past few years the problem of channel weeds has been given consideration by scientists, and a method found for control of cumbungi (see *Journal of Council for Scientific and Industrial Research*, February, 1940) by cutting at such intervals that the plant is smothered beneath the water.

It has also been found that the common reed or cane grass can be treated by spraying with sodium chlorate, at a cost for material of about £1 per square chain. Success has also been obtained in New South Wales experiments on *Paspalum distichum*. Experiments are being commenced in various parts of the

EFFICIENCY IN USE AND CONTROL OF WATER—ROCHESTER, ECHUCA, AND BOORT.

District and Name.	General Layout for Irrigation.	Irrigation Structures.	State of Irrigation Channels.	General Layout for Drainage.	State of Drains.	Provision of Water for Stock.	Total.
Possible Points	20	20	20	15	15	10	100
Rochester.							
Gorman, E.	20	16	18	12	10	8	84
Splatt, R. T.	20	14	16	12	12	7	81
Fehring, D.	20	12	20	10	10	8	80
Echuca.							
Sinclair, J. McI.	20	18	17	12	9	10	86
Ellis, H.	20	14	15	18	9	7	83
Patman, A. E.	20	12	16	12	8	7	75
Boort.							
Boyle, L.	17	18	20	10	8	5	78
Webb, R. H.	17	15	20	8	10	5	75
Lanyon, V.	17	12	15	12	10	8	74

EFFICIENCY IN USE AND CONTROL OF WATER—PYRAMID HILL, CALIVIL, AND DINGEE.

	General Layout and Convenience.	Percentage Land under Cultivation.	Returns from Stock, &c.	Control of Water, &c.	Conservation of Fodders.	Poultry and Pigs.	Fences.	Buildings.	Freedom from Weeds.	Care of Implements.	General Appearance, Dwelling and Surroundings.	Total.
Possible Points	40	40	30	25	22	22	18	18	15	10	10	
Hamley, H. J., Dingee ..	40	40	30	20	22	18	16	18	12	10	9	235
Brereton, G., Calivil ..	35	38	30	20	18	18	18	15	12	10	10	224
Anset, F., Dingee ..	35	40	28	23	22	15	16	12	12	5	10	218

State with other sprays poisonous to plants, and it is hoped that some of these will prove suitable for the control of channel weeds.

Various methods were used by the competitors to keep down weed growth in the channels. The commonest was cutting with a slasher or a scythe. Mr. J. Sinclair, Bamawn Extension, used an implement, termed a grader ditcher, for this purpose. This was particularly useful in his case, where, as with other orchardists, several of the smaller channels are ploughed in each autumn and remade in the spring.

In the case of channels supplying annual pastures, and which were dry during most of the year, burning with or without cutting was effective.

An earth bank used as a stop. To block this, earth will have to be dug out of bays causing loss of surface soil and additional work.

Water Supplies for Stock.

There is a tendency among irrigation farmers to consider adequate water supplies for stock the last essential to be provided on the farm, and, in the interim, to consider that any form of water supply is sufficient. The entrants in these competitions were no exception, and in very few cases was special provision made for the watering of stock in the various paddocks, the tendency being to use the distribution channels in the summer and to have one dam in a central position for winter use.

The result of this method is that water lies in the channels between irrigations and fosters the growth of weeds, the channels are damaged by the trampling of the stock, and in many cases seepage causes a rise in the water table. In addition, the water becomes warm, or even hot and unpalatable, thus affecting the general health of the stock and the flow of milk in the case of dairy cows. In one case provision for watering stock was made by means of small dams supplying two paddocks, which could be readily filled at each irrigation, and in a few other cases there was more than one dam on the holding.

Drainage.

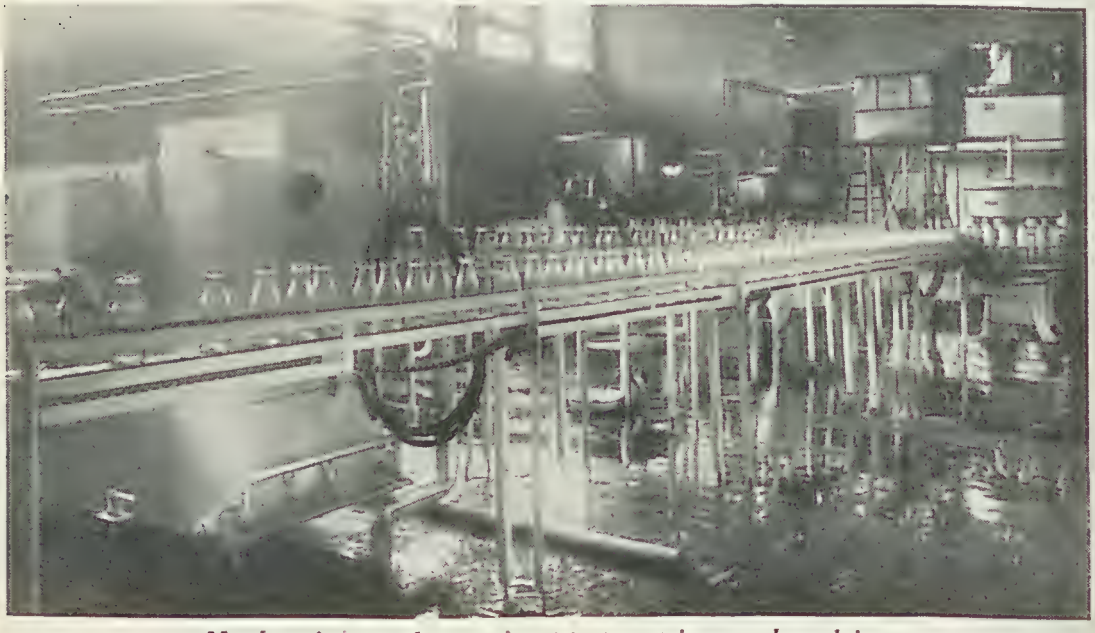
Drainage is usually considered to be the handmaiden of irrigation, but in these competitions it was surprising how few irrigators definitely provided for surface drainage. In most cases some outlet was available, but the cutting and cleaning out of the drains seemed to be left until they were needed to drain irrigation water. It appeared that a sudden fall of rain would have to find its way to the outlet as best it could. One exception was noted in the case of Mr. H. Ellis, of Bamawm, who, although on a naturally low block, had

[*Continued on page* 340.

Metals Used in the Dairying Industry

Their Effect on Dairy Produce

By W. R. Jewell, M.Sc., B.Met., F.I.C. Agricultural Research Chemist



Metal equipment plays an important part in a modern dairy.

FROM the time milk leaves the cow until it is consumed as such or manufactured into butter, cheese, or other milk products, it is more or less constantly in contact with a variety of metallic equipment for various lengths of time, and at various temperatures. It is important to know what effect milk has on various metallic surfaces and what effect traces of metal, dissolved from these surfaces, may have on the milk itself or on products manufactured from it. This question is of great interest to supervisors and technical men engaged in the production and manufacture of dairy products, and also, to a lesser degree, to the dairy farmer who handles the milk from which these products are manufactured.

A large amount of information is now available on the subject, but it is scattered throughout text-books and technical literature, and is not readily available in a concise and convenient form. The object of this article is to supply, mainly from a metallurgical point of view, a broad outline of the subject for the benefit of those whose duties do not demand a very intimate knowledge, but who are nevertheless interested to a certain degree in the problems involved. It is obviously impossible in a short article to do more than cover the subject in a general way, omitting scientific data and detailed discussions of the many interesting points involved.

Choice of Metal for Dairy Equipment.

The choice of metals for dairy equipment is influenced by a variety of factors, and it is convenient to discuss these factors before proceeding to consider how the different metals and alloys, at present in use, conform to these requirements. The principal factors may be listed as follows:—(*a*) life and cost of equipment; (*b*) availability in various shapes and ease of fabrication; (*c*) requisite mechanical properties; (*d*) resistance to abrasion and impact; (*e*) ease of cleaning; (*f*) efficient heat

transmission; (*g*) relative freedom from corrosion by milk or by milk products and by-products; and (*h*) influence of the metal on the flavour and quality of milk and its products.

Life and Cost.

The cost of a particular metal, and therefore the cost of equipment made from that metal, are obviously of primary importance. Cost immediately rules out certain very desirable metals such as platinum. In other cases the high initial cost may be warranted if equipment made from such metal has a correspondingly longer life. A typical example of this is furnished by stainless steel, where the first cost, although very high, is practically the only cost, due to the extraordinarily long life of equipment fabricated from such metal. On the other hand, with tinned articles the initial cost is relatively low, but the life of such equipment is relatively short, and re-tinning, which costs money, is necessary at intervals. Cost is also influenced by the ease or otherwise with which equipment is fabricated from different metals, an aspect which is discussed in the next paragraph.

Availability and Workability.

Due to the complicated nature and changing designs of dairy equipment, the requirements of a suitable metal, as to availability in various shapes and ease of fabrication, are very broad. Any metals for dairy equipment must have satisfactory fabricating qualities such as malleability, which influences its capacity to be pressed or spun into the desired shape, and the ability to be easily soldered or welded.

Mechanical Properties.

A metal of considerable structural strength is necessary for strong and light designs, which require it to possess physical strength as thin sheeting. These desirable mechanical properties must, of course, be combined with those properties which make for workability.

Resistance to Abrasion and Impact.

Resistance to abrasion and impact is, of course, one particular mechanical property, the importance of which warrants separate consideration. Cleaning operations subject milk-handling equipment and some dairy equipment to an unusual amount of abrasion and impact. Handling of certain dairy equipment also involves its subjection to impact. Metal suitable for such equipment must be able to withstand this treatment without deformation or undue deterioration.

Ease of Cleaning.

The need for absolute cleanliness in all aspects of the dairying industry is so well-known as scarcely to need mentioning. Different metals, because of their surface structure, or because of the ease with which they produce a polished finish, have different cleaning requirements.

Efficient Heat Transmission.

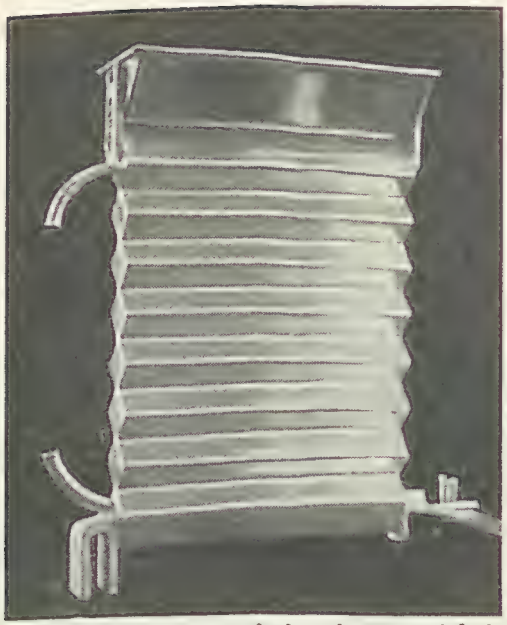
With certain types of equipment, such as coolers and pasteurizers, the ease with which heat can be transmitted to various metals is a factor of great practical and commercial importance in aiming at the correct choice of material. It is the factor that influences, most of all, the time element in the handling of dairy products and the efficiency of pasteurizing and cooling processes. One measure of the ability to transmit heat is given by the co-efficient "k" of conductivity of heat, the greater the co-efficient of any particular metal, the greater the power of conducting heat. The value of "k" for certain metals and glass is:—

Copper	.918
Aluminium	.480
Zinc	.265
Brass	.260
Iron	.161
Tin	.155
Nickel	.142
Glass	.0028

From this table it is obvious that copper is one of the best conductors of heat, and this is one of the chief reasons for the strong position it holds in the dairying industry.

Freedom from Corrosion by Milk.

Any metal, to be suitable for use for dairy equipment, must be such that its surface is not corroded by milk or by its acid by-products. This is a very important factor, as replacements of corroded vats, coolers, buckets and cans make up a considerable proportion of the annual expense of the dairyman or dairy company, and much inconvenience can be caused if replacements become necessary at an inopportune time. All dairy equipment must also withstand the corrosive action of steam, soap, and alkaline detergents, while certain equipment such as coolers must also resist the corrosive action of brine.



Efficient heat transmission is essential in cooling equipment.

Influence of Metal on Flavour and Quality.

The previous paragraph indicated that it was essential that dairy equipment be resistant to corrosion. Another, and more important, aspect of the general question of corrosion resistance of dairy equipment is that which is concerned with the influence of the dissolved metal on the flavour and quality of milk and its products. While it is important that the equipment should be constructed of metal which would not deteriorate because of corrosion, it is only when the actual solution of the metal by milk is sufficient to affect flavour or quality that the question of corrosion becomes of utmost importance.

Research into the question of metals and milk has been directed, not so much to the subject of preserving the life of the equipment, but rather to preventing deterioration of milk and its products by metallic contamination. Because of this, most attention has been given to a study of such metals as are likely to cause deterioration in milk products.

One would not ordinarily look upon milk as a corrosive liquid, yet it has been found that many metals and alloys suffer corrosion when exposed to milk, particularly at higher temperatures. There are many theories of corrosion applicable to the particular instances of corrosion by milk, but it is not necessary in this article to consider these theories at all. It is sufficient to say that the study of corrosion by milk is complicated by the very nature of milk. Being of biological origin, milk is a heterogeneous mixture which may be considerably altered during storage by bacterial or enzymic action. Because of this, laboratory corrosion tests with milk, while decidedly useful, are not an absolutely reliable index of what may be expected in actual practice, and experience gained in actual use is therefore of very great importance.

The solubility of metals in milk is influenced by—(*a*) temperature, (*b*) time of contact, (*c*) rate of flow or agitation, and (*d*) acidity of the milk. Usually, the higher the temperature the more rapid the corrosion. For instance, the solubility of tin in milk at 150°F. is approximately 50 per cent. greater than what it is at 65°F. Further, the solubility of copper in milk increases with increasing temperatures up to about 160°F. Naturally, the longer the time of contact the greater the amount of metal taken into the solution. Agitation of the milk may influence the rate of corrosion one way or the other, but the presence of air in the milk usually intensifies its corrosive action. As would be expected, increasing acidity also increases the solubility of metal in milk.

Milk, along with all other naturally occurring products, contains traces of rarer elements naturally present, including the metals copper, zinc, tin and iron. It follows that traces of these metals would also be found naturally present in other dairy produce originating from milk. Fresh milk may contain about 0.3 parts per million of naturally occurring copper, and up to 2 parts per million of iron, while normal butter may be expected to contain approximately 0.2 parts per million of copper, and 0.5 parts per million of iron. These small amounts, naturally present, have no ill-effects on the produce, and are probably essential for the successful growth of man and animal. It is when these amounts materially increase, or are in different chemical combinations, that trouble occurs.

Before a metal can exert an injurious effect on milk or milk products it must obviously go into solution. Solution may be the result of direct chemical action of the acids or salts of the milk, or the metal may be introduced by contact with residues of corrosive washing solutions and sterilizing materials. Metal going

into solution forms a complex combination with the proteins that are present, and the metal proteinates are absorbed on the surface of fat globules.

The effect of metallic contamination may be threefold. Firstly, it may give a direct metal flavour, due to the presence of metallic salts having in themselves a metallic or bitter flavour. The concentrations of metals necessary to bring about this effect are relatively high and are seldom reached in practice. Iron is, perhaps, the most likely metal to be present in sufficient concentration to produce a metallic flavour.

Secondly, metallic contamination may produce deleterious effects by either catalytically influencing the process of oxidation or by a selective influence on bacterial processes, resulting in deterioration of quality and the production of taints. These are by far the most serious effects of metallic contamination, and they may be brought about by amounts of contaminating metals much smaller than are necessary to impart a metallic flavour. For instance, traces of certain metals, particularly copper and iron, accelerate bacterial action in butter, and stimulate the production of oxidation and decomposition products, producing progressive flavours with age, a fishy flavour being first developed, followed by tallowiness and bleaching of carotene.

Generally speaking, with any one metal the greater the amount of corrosion the greater the effect on milk or its products. The actual flavour and the rapidity with which it develops vary with the metal in solution. In broad terms, the contaminating effects of the common metals may be described thus:—

Copper is the most active of the metals in its damaging influence on the quality of milk and its products, and in developing intense "off" flavours. While the immediate damage to flavour may be slightly less pronounced in the case of copper than with iron, the presence of even very minute quantities of copper salts in dairy produce is capable of producing most intense progressive flavour deteriorations that are due to oxidation and catalytic changes. Two to four parts per million of copper produce the maximum "off" flavour in milk, while 1½ parts per million are ample to give an "off" flavour in 24 hours in milk of good hygienic quality stored at a low temperature. Even as low as 0.5 parts per million, if not naturally occurring, can cause an oxidized flavour to develop in butter. Two consignments of butter were recently investigated in which the surface colour had been bleached to a depth of over one inch and in which the tallowy flavour was most pronounced. One case contained four, and the other six parts per million of copper.

Iron is one of the metals showing lowest resistance to corrosion and milk in contact with iron is therefore rapidly contaminated by it. The effects of such iron contamination are almost as bad as with copper although they may not be so rapidly developed. While with copper the tallowy stage may be developed without the intermediate fishiness, with iron the fishy flavour develops first.

Zinc is little better than iron from a corrosive point of view and the amounts of zinc which are dissolved by milk are sufficient to produce marked "off" flavours. Because of this, galvanized iron is of no use in the production of dairy equipment.

Copper Alloys including brass and bronze produce an effect similar to that produced by copper but to a somewhat less marked degree.

Tin is soluble in milk to a relatively high degree, considerably more so than copper. But fortunately the salts of tin appear to cause no noticeably injurious effect on the flavour of milk products. Experiments have indicated that tin is harmless in this respect and that under no conditions was there the slightest suggestion of metallic or other "off" flavours with any concentration of tin experienced under ordinary practical conditions. This, of course, is one of the principal reasons for the great popularity of tinned copper surfaces in dairy equipment.

Nickel is a desirable metal in the handling of milk although it is more soluble than tin. Its effect on flavour is not entirely negative and a slightly metallic flavour may result under some conditions. It is satisfactory in contact with sweet milk but not with highly acid milk. The maximum amount of nickel dissolved by milk under optimum conditions for solution is about twelve parts per million, but two to three parts per million is probably nearer the concentration usually met with in practice. Nickel is said to be as satisfactory as tin in protecting butter against progressive flavour deterioration and prolonged contact of butter with nickel fails to produce a metallic flavour in butter. Although both nickel and tin are satisfactory as regards the production of "off" flavours, it is still doubtful whether the presence of considerable amounts of their salts in dairy produce is desirable.

Aluminium is superior to iron, zinc, copper, tin and nickel in resistance to corrosion by milk. It is, however, lacking in resistance to alkalies, and residues from aluminium equipment washed with alkaline detergents would be expected to raise the aluminium content of milk subsequently placed in such equipment. No trouble is experienced with milk products in contact with aluminium except with those of intensely high acidity, when corrosion is more pronounced and a very slight metallic flavour may be discernible.

The third way in which metallic contamination may affect dairy produce is that it may result in adding to the milk concentrations of metals that are toxic to human beings. In sufficient quantity copper, zinc, and tin are definitely poisonous and their solubility in milk products is therefore a factor of considerable importance, both as regards their physiological effect on the human system as well as in their influence on the valuable vitamins present in milk. It is extremely unlikely that the concentration of metals in milk or milk products would ever reach the stage at which it would be dangerous to health, particularly as such metals are not cumulative poisons but are readily excreted by the human system. Further, the food standards in various States limit the amounts of metals permissible in foodstuffs and these limits are well above the concentrations which would actually cause deterioration of milk products. Cases have been reported, however, of the poisoning of pigs by the zinc dissolved from the surface of galvanized containers by acid butter milk.

Metals used in Dairy Equipment.

The foregoing part of this article has outlined, in very general terms, the various factors involved in the choice of a particular metal for use in dairy equipment, and has shown that, of these factors, corrosion and consequent metallic contamination are by no means the least important. When all the factors are taken into consideration it is found that only a comparatively few metals and alloys measure up to the requirements. This small list includes:—copper and its alloys (brass and bronze); tin and tin-coated metals; nickel and its alloys; aluminium; and stainless iron and steel.

It is now proposed to proceed with a brief discussion of each of these, mainly from a metallurgical standpoint.

A polished surface makes for cleanliness, especially in tubes.

Copper.

Some of the properties of copper have already been discussed but in spite of its many admirable properties—strength, low cost, ductility, heat transmission, etc.—its contaminating effect on milk is all-important, and renders it unsuitable for dairy equipment unless protectively coated. However, owing to its excellent mechanical and physical properties, plated copper is still the most widely used metal in dairy equipment and more detailed consideration is given later.

Brass and Bronze.

Brasses are essentially copper and zinc alloys, the percentage of zinc varying with the use to which the alloy is to be put. For instance, rolling brass is usually composed of 70 per cent. copper and 30 per cent. zinc, whereas casting brass has frequently a 66/33 composition. In special cases small quantities of other metals, for example 1 per cent. of tin, may be added. Bronzes are primarily copper-tin alloys of varying composition, 90/10 and 80/20 being very common. Phosphor bronze contains a small percentage of phosphorus (approximately 0.2 per cent.) which is added to increase the hardness of the alloy. In special bronzes small additions of other metals—magnesium nickel, etc.—may be made. The use of copper alloys in dairy equipment is limited to castings,

and here again a protective coating is required if contamination of the product with copper is to be avoided.

Tin and Tinning.

Tin is a metallic element with a relatively low melting point of 450°F. It is highly malleable but of low mechanical strength, although when subjected to mechanical work its tensile strength is increased. Its maximum malleability is found at 212°F. and it becomes brittle at 390°F. At low temperatures tin changes to a grey friable powder known as "grey" tin and once this starts the change can proceed at ordinary temperatures. This breakdown of tin is known as "tin pest" which has been responsible, in comparatively rare cases, for the deterioration of tin equipment.

The many virtues of tin, particularly as regards its lack of detrimental effects on milk products, have already been discussed. Tin is a relatively expensive metal and solid tin equipment, which also lacks certain desirable mechanical properties, is therefore not seen in the dairying industry. Fortunately tin has a low melting point and the property of adhering, when melted, to other metallic surfaces, which results in the tremendous quantities of tin plate and tinned articles generally found in everyday use.

It has already been shown that copper equipment has many advantages, outweighed by the disadvantage that it contaminates milk and milk products. It naturally follows that copper equipment, so desirable because of cost, ease of fabrication, and heat transfer properties, should be protected by a coating of tin. One other advantage of tin-coated copper equipment is that, in many cases, the tinning may be carried out after fabrication of the equipment, thus covering joints and seams with a protective tin film.

The same protective coating can be applied to iron and steel articles, including tinned plate and tinned cans and buckets, but it is more difficult to obtain a perfect tin coating on iron and small pin-holes in the coating provide focal points for corrosion of the underlying iron. This corrosion is further aggravated by the use for washing purposes of strong caustic alkalies which readily attack tin. Milk cans so maltreated lose their tin coating rapidly,

Quality of tinning is of great importance with milk cans.

rust profusely, and are soon in a bad and unsanitary condition. It is claimed that such cans are responsible for a great deal of the metallic flavour in cream arriving at American butter factories, and there is no doubt that the factor of rusting cans plays a very important part in the production of cream of poor quality in any country. The corrosion of such cans may be minimized by the use of detergents known to be less corrosive of tin, of which tri-sodium phosphate is one.

Tin, like all other protective coatings, is protective only while it is continuous. If the coating be broken, as in the case of "pinholing," corrosion at that point is much accelerated, actually more so than if there were no tin coating at all. Unfortunately the tin coating is not everlasting, and before it is actually noticed, the underlying metal may be exposed and the quality of the product lowered by metallic contamination. Tinned articles are not therefore entirely satisfactory but, despite their disadvantages, they still form the bulk of dairy equipment in all parts of the world.

Tinned iron is also readily corroded with hypo-chlorite solution, or with any solution containing free chlorine, so that such sterilizing solutions should be used judiciously with tinned cans. It will be noted from the foregoing that the resistance to corrosion of tin-plated iron and steel depends very largely on the quality of the tinning, a factor which deserves more consideration than it is sometimes given in the manufacture of such equipment.

Nickel and its Alloys.

Nickel is a white metal of high purity and high melting point and with good tensile strength, comparable with that of mild steel. It has excellent resistance to shock and fatigue and is one of the strongest of the non-ferrous metals. It is used in about 100 different alloys, may be made malleable and ductible by the addition of a very small percentage of other metals, and may be drawn into tubes which can be fabricated into cooling coils. It gives a surface which is easily cleaned and therefore capable of good bacteriological control. Its high cost is a definite drawback to its more extended use, and, contrary to the case with tin, nickel plating is not particularly satisfactory for dairy equipment.

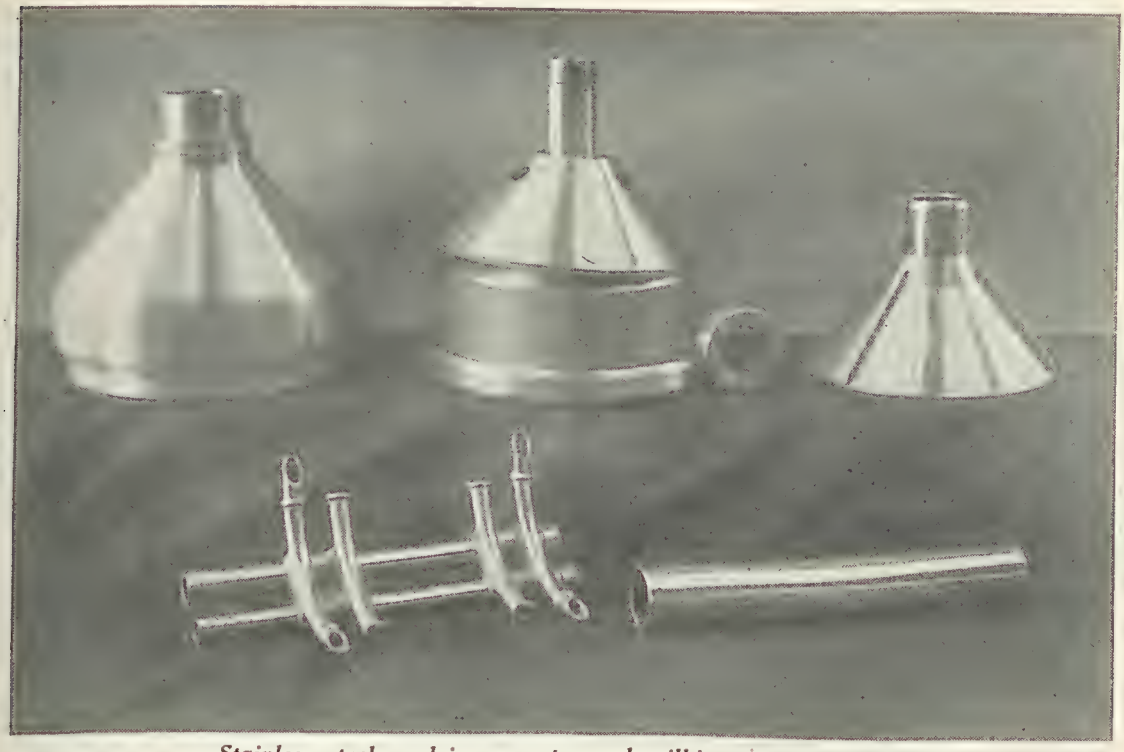
Some of the alloys of nickel are more interesting than the metal itself. Monel metal is a product which was first produced by the smelting and refining of a naturally mixed ore of copper and nickel, but it is now prepared synthetically. It is essentially an alloy of nickel and copper (2/3rds. nickel and 1/3rd of copper) with about 5 per cent. of other metals. It has steel-like strength, high ductility, considerable toughness, corrosion resistance and exceptional strength at high temperatures. In dairy use, however, it has proved disappointing and it is only of value if in contact with cold sweet milk for a comparatively short time, as in milk pails. It is no use for prolonged contact with milk or milk products, when contamination with copper occurs.

An alloy known as Inconel is probably the best of all nickel alloys from the viewpoint of corrosion resistance. It is essentially a nickel-chromium alloy containing 80 per cent. of nickel and 14 per cent. of chromium and 6 per cent. of iron. It possesses the inherent corrosion resistance of nickel plus the surface stainlessness contributed by chromium, while still retaining malleability and workability. It may be drawn into tubes and welds well. Its corrosion resistance properties are particularly good, being completely resistant to the action of sour milk and cream, hot or cold, aerated or non-aerated. It is highly resistant to butter milk and also to alkalies. In spite of its admirable properties its use in dairy equipment is again very limited because of its high initial cost.

Aluminium.

Aluminium is a very light and cheap metal which can be rolled into a sheet, pressed into shapes or drawn into tubes. The fact that it is used as a cooking utensil is an indication of its anti-corrosive properties and, as stated earlier, from many points of view it is a suitable metal for dairy equipment. Although definitely soluble in milk it does not affect its flavour, except milk with an extremely high acidity, when there may be a slight metallic flavour. Factors of great importance in influencing its resistance to corrosion by milk are the physical state and purity of the metal. Aluminium sheeting, usually of a high purity, withstands corrosion better than aluminium castings. Aluminium is a soft metal and will suffer damage under rough handling, so that robust construction is advisable.

The biggest disadvantage of aluminium is its instability to alkalies which readily corrode it. These include alkaline cleansers such as caustic soda and alkaline carbonates, frequently used as detergents for dairy equipment. However, the addition of one part of sodium silicate



Stainless steel used in separator and milking machine parts.

(water glass) to 1,000 parts of sodium carbonate has the effect of completely retarding the corrosive effect, and cleansers of this nature are available.

There are several drawbacks to its use in dairy equipment but these can be minimized, if not entirely eliminated, by an intelligent study of the metal, suitable construction and proper care in use. Because of cheapness, lightness, purity, mechanical properties and comparative inertness in contact with milk, aluminium has lately been more extensively used for the manufacture of dairy plant, especially storage vats and utensils.

Stainless Steel.

Stainless steels were discovered in 1913 by Brearley and were first used for the manufacture of cutlery. These were high chromium steels which required to be heat-treated before stainless properties were fully developed. There have been many advances since that date including the discovery of chromium-nickel stainless steel, first developed by Krupp, where the nickel is sufficiently high to produce a corrosion-resistant alloy without heat treatment. It is only these chromium-nickel steels that are used in the production of dairy equipment and they are now fairly standardized in composition, there being only minor modifications with different brands. The steel contains 18 (16-20) per cent. of nickel and 8 (7-11) per cent. of chromium. It is available in sheets, tubes and castings and is particularly resistant to corrosion by milk.

This type of steel is not satisfactory for welded construction as the heat of welding alters the steel in the zone of welding, producing structural changes which materially affect corrosion resistance. This can be overcome by a subsequent heat treatment which, however, is usually not possible in fabricated equipment. There are, however, special stainless steels available which are quite satisfactory for welding purposes and which should be specified when welding is involved. These steels contain the same copper and nickel contents as in the above-mentioned steels but with small additions of silicon (1.5 per cent.) and tungsten and vanadium (0.5 to 1 per cent. of each), which enable the steel to retain its corrosion resistance even when heated by welding.

The initial cost of stainless steel equipment is admittedly relatively high, but it must be remembered that the initial cost is practically the only cost as such equipment has probably a longer life than that of equipment made from any other metal. In fact, the introduction of chromium-nickel steels actually meets the needs of an ideal metal surface for equipment coming into contact with milk and its products.

Combination of Metals.

When two different metals are in contact and are immersed in a liquid, different electrical potentials are set up between the two metals, thus accelerating corrosion by electrolysis. For instance, if aluminium and nickel be in combination the corrosion of the aluminium is increased twenty times above that of aluminium alone. Similarly, in a nickel-copper combination the corrosion of nickel is accelerated. The presence of two or more metals in the same piece of dairy equipment is therefore fundamentally unsound, and it is advisable to avoid a multiplicity of diverse metals in one and the same piece of equipment.

Conclusion.

In this article an endeavour has been made to cover a subject to which a series of articles would be necessary for adequate treatment. It has therefore been possible only to outline, in a very general way, the factors influencing the choice of metals for dairy equipment, the influence of various metals on dairy produce and a discussion of the characteristics of the different metals used in dairy equipment. It is not claimed that the article is in any way original; the information has been culled from a large number of sources for which individual acknowledgement is not considered necessary.

The Control of Irrigation Water

(*Continued from page* 331.)

laid pipes so that the surplus water in any low patches could be run into the district drainage system.

General Efficiency.

In a competition of this nature points could have been given for the actual results of the use of water, that is, production per acre-foot of water used. With this in view, competitors were asked for details of stock carried and hay produced in relation to area and water used. It was found, however, that the variation in forms of agriculture practised prevented such a comparison. Some competitors conducted dairying only on land, the whole of which was irrigated, while others in the same competition were running sheep partly on irrigable, and partly on non-irrigated land. In addition, the measurement of the water was not accurate enough, in some cases, for proper comparison of returns in relation to water used.

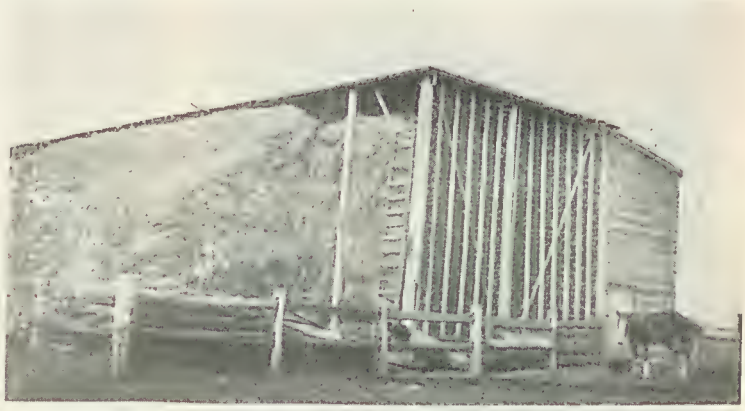
Very few irrigators appear to keep any definite record of dates of irrigation or of water used per paddock or per irrigation. Most men kept some record of the total used as compared with their water right, but that was all, and they were not able to say whether a paddock took 18 inches or 24 inches of water a season. As a contrast Mr. J. Sinclair, of Bamawm, by means of a series of plans of his holding, could at any time tell the date of irrigation of any portion and the amount of water used. These plans are foolscap size, and several are prepared at one time as carbon copies. Mr. Sinclair also uses a series of them to record areas sprayed, date of spraying, and numbers of codling moths caught in lures.

The place-getters in each competition and the points allotted to them are set out in the accompanying tables.

Fodder Conservation Competition

Maffra District, 1940

Report of the Judge, E. T. Beruldsen, B.Sc. (Agric.), Senior Irrigation Officer



A well-filled hay shed of lucerne and meadow hay on the property of Mr. E. J. Pearce, Boisdale, winner of the competition.

THE quantity and quality of the fodder reserves inspected during the judging of the Maffra Fodder Conservation Competition testified to the good farming methods of the competitors in particular, and of the district generally. Four out of the nine competitors had conserved fodder well in excess of the high standard of requirements as set out in the rules of the competition. These standards are set by the Royal Agricultural Society, which for some years has endeavoured very laudably to stimulate fodder conservation throughout the whole State by sponsoring these competitions.

In an irrigation area such as Maffra, there does not appear to be the same necessity for having on hand a large excess of fodder over requirements as there would be in the drier parts of the State, since in the irrigation areas paddock feeding is restricted for only a comparatively short period during the year. Indeed, at the time of inspection in the second week of May, none of the competitors was short of paddock feed; on the contrary, there was a good growth of lucerne, and the pasture paddocks were in good condition for grazing. Some had additional sources of feed, such as beet tops, maize, and saccaline. On Mr. S. S. Moulton's farm at Newry there was a small paddock of mangels which was yielding very heavily.

All competitors were awarded the ten points included in the 50 allotted to carrying capacity, because of the abundance of green feed. One competitor, Mr. E. J. Pearce, had more than three times the standard requirements of fodder conserved, and, in having this large amount on hand, obtained an initial lead in the competition. For the purposes of judging, it was considered that twice the actual requirements merited the full allotment of points for excess fodder, and those not attaining full points have been judged on a *pro rata* basis.

It is an extremely difficult task to obtain reliable figures for production costs, but, in allotting arbitrary values to each competitor, consideration has been given to such factors as the relative cost of production of cereal, lucerne and meadow hay, and silage, and the proportion of these conserved by each competitor. Also, distance and facilities for feeding out have been considered. For example, convenience of storage and transportation of baled hay has been offset to some extent by the extra cost of baling the hay. Incidentally, in baling hay it has been the experience of most farmers that the cost increases considerably when the plant is insufficient to deal with a reasonable output per hour. Greater care must be taken in the curing of the hay, and a lower moisture content is desirable when hay is pressed.

The great bulk of the fodder reserves exhibited were most suitable for the purpose for which they were intended. While in a dry area the conservation of succulent fodder, such as silage, might confer an advantage to a competitor in a competition of this kind, on irrigated properties the need is rather to conserve fodder of a dry nature which,

A heavy crop of saccaline from which silage was made (Mr. A. Little, Nuntin).

together with the green pasturage offering, will provide an adequately balanced ration for the stock. In this respect, meadow hay and lucerne hay are unsurpassed as suitable reserves. They provide that proportion of fibre which is so necessary to maintain stock, especially ruminants, in good health, and at the same time contain adequate protein and be highly digestible. They have the additional advantage of being cheaper to conserve than cereal hay.

Surprisingly little waste occurs when these fodders are fed out to the stock, even when merely carted out and spread on the ground in the paddock where the stock are grazing. It has been the experience of the judge that under those circumstances there is less waste with meadow hay than with lucerne hay. Quite frequently the stemmy portions of lucerne hay are neglected, whereas the finer stems of the grasses and clovers in meadow hay are eaten readily. Most of the competitors chaffed the lucerne hay and fed it in the bails at milking time. This method of feeding lucerne hay avoids waste.

Generally, the quality of the fodder reserves exhibited were of excellent quality, and reflected care in curing and handling. In many cases, however, a considerable amount of deterioration had occurred in the stacks. Stacks generally were too small, and this increased the area exposed to the weather, and, since in most cases the stacks were not thatched, a considerable amount of deterioration had occurred on the outside.

The tendency was to put the produce of one small paddock of lucerne into a stack and to commence building another stack at the succeeding cut. By keeping the centre of the original stack well built up, and covering with a weighted tarpaulin or some sort of cover between cuts, much larger stacks could have been erected and much deterioration avoided. In other irrigation areas, stack covers made with bags are very common. These alone afford a considerable amount of protection, but are still further improved when dipped in some waterproofing material.

Fodder reserves were located either in proximity to the cow bails in well fenced off yards, or in yards in a fairly central position

Baled lucerne hay on the property of Mr. S. S. Moulton, Upper Maffra.

with easy access to the grazing paddocks. The sites for the stack yards were on high ground and generally were well drained. No rubbish was allowed to collect which might increase the risk of fire. Although chaff-cutting plant was kept in or near sheds and stack yards, the use of electric power generally minimized fire risk. With the bulk of the reserves being lucerne or meadow hay, negligible damage had occurred through mice, although several stacks of oaten hay had been damaged by this pest.

One or two of the competitors feed a supplement all through the year, especially where the herd is composed of high producing or pure-bred cows. This had the effect of apparently reducing the amount of fodder reserves on hand at the time of the inspection below the standard requirements, although during the season they might have conserved considerably in excess of these requirements. Unfortunately, in such cases there is no provision in this competition for allowances to be made.

Regarding those who supplement the grazing with their fodder reserves only during the winter months, it may be worth considering commencing feeding out earlier in the autumn. Those farmers who have employed this system have found that their pastures have not been eaten out before the winter, and that by feeding out a smaller ration of hay over a longer period they have had better production from their herds, probably through better balance of the total ration.

The Awards.

The fodder reserves which Mr. E. J. Pearce, of Boisdale, had accumulated on his property deserved first prize in this competition, and were a remarkable tribute to industry and good farming methods. The whole property of 86 acres has an irrigable area of 56 acres, not all of which has been sown down to pasture or lucerne, since sugar beet is cultivated. The stock comprise 30 milking cows, 2 bulls, 16 yearlings, 16 poddies, and 4 horses

Inspecting high quality silage on Mr. A. Little's property.

The fodder reserves consisted of 140 tons of lucerne hay and 31 tons of meadow hay. The great bulk of this is stored in an excellent shed, only 9 tons of lucerne hay in a small stack, and about 20 tons of the meadow

MAFFRA FODDER CONSERVATION COMPETITION, 1940.

Exhibitor.	Fodder Value.		Location.	Protection.	Economy of Production.	Carrying Capacity.	Excess over requirements.	Total.
	Suitability.	Quality.						
Possible points	30	35	10	20	20	50	35	200
E. J. Pearce, Boisdale ..	28	31	10	19	19	50	35	192
W. Amey, Nuntin ..	27	30	10	18	19	50	9	163
A. Little, Nuntin ..	25	29	9	16	18	50	11	158
T. M. Noble, Maffra ..	28	33	9	16	19	47	..	152
C. Tucker, Maffra ..	29	34	10	17	19	39	..	148
L. Donahoe, Boisdale ..	25	27	8	14	16	50	4	144
J. W. Kerr, Tinamba ..	26	28	9	16	19	46	..	144
S. S. Moulton, Upper Maffra	26	31	9	17	17	36	..	136
S. S. Moulton, Newry ..	27	32	9	17	18	27	..	130

Giant mangels grown by Mr. S. S. Moulton, at Newry.

hay abutting on the hay in the big shed, not being under cover. This shed is adjacent to a milking shed with eighteen bails, and the cows get a fairly long spell of bail feeding at milking time. The hay is mostly chaffed, but some long hay is fed out as well. There was excellent young growth on a lucerne paddock. In addition, there were 15 acres of beet which were providing a considerable amount of tops, and the residue from 5 acres of maize would be available for winter grazing. Most of the hay was of excellent quality, although some of the carry-over hay from the previous year had deteriorated slightly.

Mr. W. Amey, of Nuntin, who won second place in the competition, also had the advantage of having an excellent shed on the property. In this was stored 55 tons of lucerne hay. Adjacent to the hay in the shed there was 22 tons of lucerne hay, but not under cover. In a stack yard some distance from the shed was a stack of 17 tons of lucerne hay. The quality of the hay generally was very good. A considerable amount of prairie grass was present in the first cut lucerne. A chaffcutter, driven by an electric motor, was in a room adjoining the hay shed. A plentiful water supply between the hay shed and the milking shed and a centrifugal pump afforded extra protection against fire.

On this property of 130 acres, nearly all irrigable, 90 acres are sown down to pasture and 12 acres to lucerne. The stock comprise 60 cows, 2 bulls, 16 yearlings, 6 poddies, and 3 horses. None of the hay is fed out in the paddock, but bail feeding is commenced in March.

Mr. A. Little, of Nuntin, exhibited quite a variety of fodders, the most interesting of which was a large pit full of silage. Up till the autumn of last year Mr. Little had not considered the possibility of making silage. In April last year he had a very fine paddock of saccaline which he did not know how to utilize since there was abundant feed elsewhere for the stock he had on hand. Departmental officers who visited the property suggested making silage, and instructed Mr. Little how to go about it. Soon afterwards he scooped out a pit approximately 90 feet long by 24 feet wide and 5 feet deep, with a 6-ft. batter. All the saccaline was carted into this pit and soil scooped back on top.

During the winter about half of this silage was used, and last spring the space was refilled with first cut lucerne, which contained a large amount of grass. Pure lucerne does not make good silage without the addition of molasses, but in this case the grass and other roughage ensured a good type of fermentation. When the pit was opened for inspection during the competitions, both the saccaline silage and the lucerne silage proved to be of excellent quality.

The pit is situated on well-drained high ground, and occupies a central position, facilitating feeding out. The area had been fenced off. It was estimated that there were approximately 140 tons of silage on hand. Mr. Little had 25 tons of good quality oaten hay in two stacks, and another stack of 9 tons of lucerne hay. In a maize crib were stored 10 tons of baled lucerne hay and 20 tons of baled malting barley straw.

The property comprises 169 acres, of which 80 are irrigable. Fifty acres are sown down in pasture and 15 acres in lucerne. In addition, there were 3 acres of saccaline and 10 acres of sugar beet. On the property were 40 cows, 1 bull, 20 yearlings, 50 poddies up to twelve months old, and 4 draught and 2 light horses. The pastures were in good condition, and the lucerne was making vigorous young growth after having been grazed.

Live Stock Notes

Reminders for July—August

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Supplementary feeding of beef cattle with grass hay.

Minerals for Stock.

CALCIUM AND PHOSPHORUS.

THE minerals calcium and phosphorus are usually referred to as calcium phosphate, because the two elements occur together very frequently as such, although, within the animal, both calcium and phosphorus have very important functions to perform both independently and in conjunction. The principal function of calcium phosphate as such is to supply rigidity to the bones and teeth which form the skeletons of animals. The skeleton acts both as a mechanical organ, forming the framework of the support of the remaining organs of the body, and as a reservoir for minerals from which a certain amount may be drawn from time to time to meet deficiencies in rations without interfering with the health of the animal. Calcium phosphate is also an important mineral constituent of milk, placed there by nature to provide for the proper development of the skeleton of the offspring.

Independently, phosphorus is a vital component of many proteins, known as phosphoproteins, such as casein of milk and phytin of cereals, and of a number of other body substances such as saliva. Lime or calcium also has independent functions to perform in regulating the acidity and alkalinity of the fodder eaten and of all the fluids and organs of the body. Calcium also works in conjunction with many enzymes which convert one substance to another within the body, for instance, the enzyme, which causes blood to clot when exposed to the air following an injury, requires the assistance of lime to clot the blood and so stop bleeding. Deficiencies of free lime within the body are associated with many

physiological diseases, such as milk fever, grass tetany, pregnancy toxaemia, &c., but whether the incidence of these diseases can be reduced by feeding lime supplements has yet to be determined.

From present knowledge, it appears that animals can make use of lime supplied in mineral form such as chalk, calcium carbonate, slaked lime or calcium phosphate for all the functions for which lime is required, but animals must be fed with some phosphorus in organic form (phospho-proteins) from which animal phospho-proteins can be formed. While the animal can obtain all its phosphorus requirements from such phospho-proteins, it can only utilize mineral phosphate for building up the skeleton and supplying some of the mineral in milk.

Following Sir Arnold Thieler's visit to Australia in 1929, the Council for Scientific and Industrial Research has conducted extensive research into the phosphorus requirements of sheep. These investigations have revealed the absence of any deficiency of phosphate amongst Australian sheep, which are remarkably free from the common mineral deficiency diseases reported from other parts of the world. Under adverse conditions, such as drought, a deficiency of organic phosphorus, however, has been found. This is due to the fact that insufficient protein has been provided for flocks during seasons when no green feed is available. Green feed, especially when young and succulent, is rich in proteins. Success following the supplementary feeding of meat and blood meals, linseed nuts and lucerne and clover hays to sheep is due to their high protein contents. In experiments at Young (New South Wales), Penola (South Australia), Winton (Queensland), and the Animal Nutrition Laboratory, the Council for Scientific and Industrial Research has found that, although sheep ate phosphatic licks readily, the phosphate supplement produced no economic improvement, whether measured in terms of gain in live weight, the quality or quantity of wool produced, percentage of lambs marked or the subsequent development of the lambs.

The Council for Scientific and Industrial Research investigators mention that (*a*) since sheep graze much closer to the ground than cattle; (*b*) since the body of a sheep contains only 2.9 per cent. of calcium phosphate, which is little more than half that contained in the bodies of cattle—4.8 per cent.; and (*c*) since sheep increase in live-weight more slowly than cattle, a phosphate deficiency amongst cattle is probable, even when there is no such deficiency with sheep. This is so, especially where cattle are grazed only on the coarse, less-nutritious, protein-deficient herbage left by sheep. Bone meal or other phosphatic supplements may then be necessary for cattle. On unimproved farms and farms where the rainfall is insufficient to warrant pasture improvement and top-dressing with superphosphate, a lick containing bone meal may be necessary for cattle. Such a lick is also advisable for cattle on a farm where protein-deficient rations are fed.

On the dairy farm, quite a lot of calcium phosphate may be removed annually, since the milking cow secretes about 30 lb. of calcium phosphate in producing 1,000 gallons (10,000 lb.) of milk. This amount can be easily supplied through the pasture by top-dressing and otherwise improving the pastures. Except for whole milk supplies to towns and cities, dairying is usually conducted in districts where the pastures respond to improvement.

The Council for Scientific and Industrial Research made some analyses of the calcium and phosphate contents of herbage plants grown with and without top-dressing, and the results indicated that top-dressing with superphosphate increased the phosphate content of the plants by 50 per cent. without altering the calcium content. Whether a lime supplement is necessary in conjunction with highly improved grassy pastures has not yet been determined.

Horses, pigs, and poultry are usually supplied with foodstuffs which contain ample phosphorus and additional supplements of phosphate not only may be wasteful, but also harmful to the animals.

The diseases following the feeding of rations deficient in calcium and phosphorus may be due to an insufficiency of both elements, a deficiency of either one, or to the elements being present in incorrect proportions. The best proportions of calcium and phosphorus are not fully known, but, on rations comprising common foodstuffs, all stock do well when from one to two or even five parts of calcium for each part of phosphorus are present.

The effects of feeding calcium and phosphorus in varying proportions by different investigators throughout the world are summarized broadly as follows:—

Rations containing less than one-half part of lime for each part of phosphorus.—The excess phosphorus causes softening of the bones, bone

deformation and rickets. The disease is also associated with loss of condition and aching bones, causing the animal to lie down frequently and walk with a creeping gait. It also occurs when the animals are on a calcium-deficient ration.

Rations containing from half to one part of lime for each part of phosphorus.—After prolonged feeding, certain animals develop the symptoms mentioned above when lime and phosphorus occur in the feed in these ratios, even though the amount of lime present would normally be sufficient.

Rations containing from one to two, or even up to five, parts of lime for each part of phosphorus.—The lime and phosphorus are in the correct proportions in these rations.

Rations containing between five and ten parts of lime for each part of phosphorus.—Even when sufficient phosphorus is fed, certain animals will develop symptoms of aphosphorosis (insufficient phosphorus) after prolonged feeding on these rations.

Rations containing more than ten parts of lime for each part of phosphorus.—The excess lime reduces the availability of the phosphorus, and, although there may be sufficient phosphorus in the foodstuff, symptoms of aphosphorosis, loss of condition, weakness, cripples, bone deformations, soft bones and bone chewing are very likely to develop. This disease also occurs when the animals are on a phosphorous-deficient ration.

The total daily requirements of calcium and phosphorus for horses and cattle are contained in 1½ oz. of bone meal, and proportionately less for smaller animals.

(A continuation of this discussion, and analyses of mineral contents of fodders, will appear in a subsequent issue of this Journal.)

Dairy Cattle.

During the next few weeks, important work on the dairy farm is that of attending newly-calved cows. When the cow is springing, she should be placed in a clean, well-sheltered paddock handy to the farmstead, and reserved for the springers. The cow will then be able to calve without interference by other stock and under the observation of the farmer. In the majority of cases, cows calve without assistance; in fact, the cow should be left alone during parturition, unless the attendant has good reason to believe that assistance is required. The calf should be left with the cow until it has been thoroughly licked and had its first feed. While the cow is springing and for several days after calving, the cow should be liberally fed on good-quality roughage, lucerne hay being the best, and greenstuff or pasture.

Some cows are likely to develop milk fever shortly after calving. If these animals can be injected with calcium boroglucinate as soon as they show the first symptoms, they seldom go down, and it will not then be necessary to interfere with the udder by inflation with air. Farmers are advised to acquaint themselves with the treatment of milk fever before a case occurs, since treatment is best administered immediately. Full advice concerning treatment can be obtained by writing to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2. Newly-calved cows should be treated gently, and milked regularly. After a few days, they can be fed full rations of roughages and concentrates.

Pastures are rather backward this year, and newly-calved cows should be liberally fed and maintained at a high level of production until the spring pastures are sufficient to carry them. Oats is the cheapest concentrate to buy, and when fed in conjunction with protein-rich fodders such as green pasture, lucerne hay or any protein-rich meal, it makes an excellent foodstuff for dairy cows.

Sheep.

The attention of sheep farmers and graziers is drawn to the forthcoming annual Australian Sheep Breeders' Show and Sale at Dalgety and Co.'s Wool Stores, Newmarket, on 6th, 7th, and 8th August. Because there will be no Royal Show this year, larger drafts of selected stud and flock rams are expected.

Graziers making purchases from the many types offering should, in all cases, select animals showing purity and type with particularly good heads, bold contours and nice balance. If the rams are being selected exclusively for wool production, the types of fleeces on the animals must be carefully examined. The buyer should look for a good upstanding wool, growing straight out from the skin, with a dense, even surface and a long staple. Character, colour and handle are desired, while such faults as bad hair and kemp must not be overlooked. A well-balanced ram which has good type and handles nicely should be sought in all other breeds.

If stud rams are required, it is a mistake to change the blood lines when the original line is proving satisfactory. This also applies to some extent with flock requirements. Help and advice can be obtained (free) in the selection of rams and ewes by personally contacting Mr. N. A. Bowman, the sheep and wool expert of the Department.

Horses.

At this time of year a considerable amount of hand-feeding is necessary, and attention of horse owners is drawn to the fact that a liberal supply of salt should be provided. It is noticed that, when insufficient salt is provided in the food, working horses endeavour to remedy the shortage by licking the saline deposits of evaporated sweat, which has collected under the harness and on the coats of their team mates. Horses will do better and keep in harder condition if a piece of rock salt is kept in each manger, or in some other accessible place.

During the winter farmers frequently ask for the best method of securely tying up the tails of horses to keep them out of the mud, and also for the best combined plaits for the tails and manes of show horses. There are several "ties" in common practice, and the publication of an illustrated article on this subject is contemplated at an early date. In the meantime, any owners who require information on this art should write to the Superintendent of Live Stock, who will outline the process.

Applications for the registration of stallions and colts rising three years old were due on 30th June. Stallion owners who have overlooked registration should write to the Chief Veterinary Inspector for full particulars regarding the Horse Breeding Act. (Mr. W. D. Shew, B.V.Sc., Senior Veterinary Inspector.)

Pigs.

To obtain the greatest benefits from grazing pigs, it is desirable to provide sufficient area and paddocks to allow rotational grazing. Wherever practicable, shelter sheds, pens, and troughs should be built on skids, so that they may be moved within the paddock or from one paddock to another. Even in large paddocks the ground around fixed sheds and troughs will soon become fouled.

On first class pasture land, half an acre should be the minimum area allowed for each breeding sow and her progeny up to baconer weight. On poorer pasture land a minimum of 1 acre per sow should be allowed.

Movable equipment for pig farms is illustrated in the free departmental pamphlet, "Pig Housing and Equipment," compiled by the pig expert, Mr. L. A. Downey.

Poultry.

It is important that pullets for egg production should be reared under the best conditions, so that when they are removed to their permanent laying quarters they will possess a high degree of constitutional vigour and the power to resist disease. This is necessary, if the birds are to be kept in the best of health, and maintain high egg production during the time they are kept under intensive conditions.

The value of rearing chickens on free range in conjunction with portable colony houses, is not fully appreciated by a large number of poultry keepers, and there is no doubt that, if this system were better understood, it would be far more extensively adopted. After leaving the brooders, chickens reared on this system thrive much better than those enclosed in small, bare yards. In the latter, the ground gradually becomes tainted, and after a few days the chickens become familiar with every part of the ground, and being weary with the monotony, will not run about as they would if given greater opportunities. By keeping the birds moving about, with plenty of exercise, they will attain good health and proper development.

At the present time oats is very cheap, and for that reason it can be used to replace much of the wheat in the grain ration. Some years ago, in a test at the State Research Farm, Werribee, oats proved a better grain than either wheat or barley, although the Department recommends a mixed grain ration to add variety. At the present time a mixture of 60 parts of oats and 40 parts of wheat is recommended for economy. As poultry are unable to digest fibre, the best quality oats is recommended.

The value of fresh succulent green food can hardly be exaggerated; it is, indeed, a most important necessity on every poultry farm, and a continuous and varied supply must be provided for both chickens and adult birds. (Mr. H. F. Clinton, Poultry Expert.)

[*Continued on page* 353.

Toxaemic Jaundice of Sheep

By A. R. Grayson, B.V.Sc., Veterinary Officer

TOXAEMIC jaundice, or as it is commonly called, yellows of sheep, is a condition which, in the past few years has been, and still is, causing a great deal of concern to sheep owners in parts of Victoria. Mortalities amounting, in some cases, to more than 10 per cent. of the flock have occurred in some outbreaks. In Victoria the condition appears to be confined to sheep of the British breeds and their crosses, Merinos rarely becoming affected. It occurs chiefly in ewes, but wethers and rams are also affected at times. Cases have not been seen in lambs or weaners, but thereafter the susceptibility appears to increase with age. Affected sheep are usually in good to fat condition.

There does not appear to be any particular set of seasonal conditions associated with the onset of the disease, losses having occurred under semi-drought conditions as well as on flush pastures at almost any period of the year. There is, however, usually a history which shows that just prior to the onset of the disease, the sheep concerned had been through a period of stress—frequently due to pregnancy and lactation, either associated with, or aggravated by, a change of pasture or by handling for treatment of some other condition, such as foot-rot.

Most commonly the disease occurs in a hyper-acute form in which the sheep are visibly ill for a few hours only. This applies particularly at the onset of an outbreak. The affected sheep become separated from the flock and stand in a dejected manner with the head down. Pulse and respirations are rapid and the body temperature is usually high. The visible mucous membranes vary from a bright yellow to a muddy creamy colour, while the skin is also a muddy yellow colour. The wool pulls out very easily, and the urine is either red or reddish-brown in colour. The sheep become comatose and die in a few hours.

In the sub-acute form the affected animals exhibit symptoms for three to four days. They cease feeding and stand about showing no inclination to follow the flock. The skin and mucous membranes are yellow. In some of these cases the symptoms persist for seven or eight days or even longer, and recovery gradually takes place. In these cases the skin and mucous membranes have a muddy yellow appearance; there is a considerable loss of body condition; diarrhoea is evident, and some weeks may elapse before the animal is normal.

The post-mortem appearances in the recently dead state are quite typical. The subcutaneous tissues, all body fat, musculature and all body organs are a distinctly yellow colour—varying in intensity from a bright yellow to a dull biscuit colour. There may be excess pericardial fluid in the pericardial sac and haemorrhages on both the outer and inner surfaces of the heart muscle. The liver is friable and deeply jaundiced. The kidneys are somewhat enlarged, softened, and present the typical "gun-metal" appearance. The small intestines are almost empty of contents, but the caecum is often congested and the contents are black and arranged in hard dry masses, coated with blood-stained mucous. The bladder is normal, but the contents vary in colour from coffee colour to bright red.

Putrefaction is very rapid in carcasses dead from this disease, and there is a characteristic offensive odour.

Considerable research work has been undertaken into this disease condition in sheep in recent years in Australia, by officers of the Council for Scientific and Industrial Research and the Departments of Agriculture of New South Wales and Victoria. This work is still proceeding. The general result of the work to date has been to confirm the hypothesis that the disease is associated with a disturbance of the metabolism of copper within the sheep's body. It is known that normally the copper content of the sheep's liver, compared with that of other animals, is relatively high. The age incidence of the disease—usually in sheep three to four years old—points to a gradually increasing storage of copper in the liver.

Under certain conditions this stored copper is mobilized and liberated into the blood stream, and jaundice symptoms follow. Analyses of blood taken daily from sheep in field experiments have shown that this actually occurs, and the sudden rise in blood copper content, which may be of short duration, precedes and causes the onset of the jaundice. These experiments also went to show that

death invariably occurred when an acidosis developed in the sheep excreting haemoglobin (the red colouring matter of the blood) in the urine. In those cases which recovered, or lived for some time after the onset of jaundice and haemoglobinuria, the urine remained neutral or slightly alkaline.

This naturally suggested that it might be possible to save some sheep which had developed jaundice by repeatedly drenching them with an alkaline mixture. Good results have been obtained by the use of frequent drenches—three to four times daily—of 2 oz. of bicarbonate of soda dissolved in a few ounces of water. In an endeavour to maintain an alkaline reaction in the urine and so minimize the number of deaths from toxaemic jaundice, it is recommended that a supply of the following lick be made available to the sheep:—

Common salt	..	50 per cent.
Calcium carbonate	..	25 „
Sodium bicarbonate	..	25 „

Fertilizing Citrus Trees—*continued from page 314.*

Each year the yield records are taken, and as often as possible the fruit from each tree will be graded to disclose any effect on size of fruit produced. Samples are taken each year for quality comparisons. It is hoped that within a few years much more information on the manuring of citrus trees will be available.

In conclusion, three other citrus trials should be mentioned. The first is at Irymple, where an area of 6 acres is planted with Washington Navel and Valencia Late orange trees on the three chief citrus stocks, namely, Citronelle, Sweet Orange, and Sour Orange. When these trees reach full bearing, which will be in two or three years, different manurial treatments will be applied, and, among many other things, the relationship of root-stock and manuring will be studied.

The second trial is located at Long Lake. It is a manurial experiment with navel oranges on a soil very different from the Mildura sands. It has been in progress since 1936, but no yield differences have occurred. The third is a smaller trial in the Wangaratta district, and has been in progress for two seasons only.

The ready co-operation of Captain Halhed and of other growers who are assisting is gratefully acknowledged.

Reference.

(1) W. R. Jewell, *J. Agr. Vic.*, Dec., 1931, p. 603.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarin who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	211
2	Warragul High School	Warragul ..	45
3	Payne, A. E. T. ..	"Yarra View," Lilydale	77
4	Dennis, Mrs. A. A. ..	Frankston ..	19
5	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	87
6	School of Horticulture	Burnley ..	6
7	Lawrence, P. H. ..	"Rainga," Tarrawarra	60
8	Banyule Stud Pty. Ltd.	Heidelberg ..	30
9	Black, Mrs. Agnes ..	Mount Noorat	34
10	Black, Estate, Late I. S.	"The Cottage," Mount Noorat	43
11	Read, John D. ..	"Springhurst Estate," Springhurst	112
12	Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17
13	Gorman, A. W. ..	"Cathcart," Alexandra	64
14	Samuel, B. T. ..	Lang Lang ..	60
15	Powell, T. S. ..	"Carellen," Mansfield	41
16	Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	16
17	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	27
18	Onley, W. H. ..	"Glenholme," Caldermeade	52
19	Payne, T. E. N. ..	"Woodburn," Kilmore	57
20	Holloway, R. W. ..	Caldermeade	54

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor.

Orchard Notes.

DURING early July, bud movement will be noticed in the early flowering varieties of almonds. Before this bud movement progresses too far, a tar distillate spray, 3 in 100, should be applied if aphids have been noticed to attack this variety in previous seasons. Also, there is still time, during the first two weeks of this month, to apply this spray to peach trees and cherry trees for the control of green peach aphid and the cherry aphid. In addition to the spraying measures, clean headlands are also necessary if the population of the green peach aphid is to be maintained at a low level during the spring. This ovicidal spray is the best known means of controlling these aphids, and is much less costly than nicotine sulphate sprays applied when the trees are in leaf. It must be applied before bud-burst stage, and preferably before much bud swelling has taken place. Those growers who have not used this spray in the past are warned to protect their exposed skin by smearing it with lanoline and by wearing goggles, because the tar distillate causes an irritation.

The black peach aphid cannot be controlled by ovicidal sprays because this pest does not lay eggs on the peach laterals. The mature insect overwinters on the roots of the peach tree, and in the spring, migrates to the growing tips and young leaves. One of the best means of control is to place a tanglefoot band around the trunks of the trees before the leaves have developed. This tanglefoot band should be about 2 inches in width and, for convenience, can be placed on a thick paper strip wound around the trunk about 1 foot from the ground. Another method to combat this pest is to scoop a small channel around the base of the tree, close against the trunk, and place in this channel waste tobacco stems or a solution of nicotine sulphate and water, 1 in 800, as soon as the insects are noticed moving up the trunk. Before planting young peach, nectarine, and plum trees, they should be immersed for one hour in a mixture of 1 fluid oz. of nicotine sulphate in 5 gallons of soapy water as a safeguard against introducing this insect into the orchard.

Some orchardists in the cooler districts in Victoria have experienced trouble in controlling woolly aphid. In these cool districts, the parasite does not appear sufficiently active in the early part of the season to maintain effective control of the pest. Where this occurs, it would be advisable for growers to apply a red oil spray, 1 in 15, after pruning. It has been found that this winter application of red oil does not materially reduce the parasite population which is protected by the hard exteriors of their victims.

As the blossoming season approaches, the importance of the incidence of frost becomes greater. Some orchardists periodically experience losses from the effects of frost on the blossoms and the young fruit after setting. When frost injury is severe, the crop is appreciably depleted, but very frequently the effects of frost injury are not so apparent to the casual observer, but the injury, nevertheless, does occur in many orchards.

Smudge fires, which produce a large amount of smoke, have been used in combating light frosts of 2 deg. or 3 deg. of intensity, but it must be understood that these smudge fires must be commenced some time before the temperature drops to freezing point. If the lighting of the smudge fires is delayed the whole beneficial effect of this form of protection is lost, because heat has already been radiated from the soil. Smudge fires can be beneficial only if they result in a blanket of smoke which prevents this radiation.

Direct heating by either briquettes or oil burners is a much more satisfactory method of frost protection. Although the initial cost of burners and equipment is rather high, it should be regarded as an insurance against losses over a number of years. It will then be found to repay the outlay, particularly when growers experience repeated frost injury.

One of the best agencies for pollinating fruit trees is hives of bees scattered throughout the orchard. The provision of two strong hives per acre of blossoming trees will result in a much more satisfactory set of blossoms, providing suitable inter-pollinating varieties are available from which the bees can obtain the pollen.

Growers who intend to carry out any grafting operations in the spring should make arrangements for the collection of suitable scion material while the trees are still dormant. This material should be bundled, labelled and heeled into the soil in a cool moist place. Scions must be kept dormant until the bark of the trees is sufficiently free for the operation to commence.

In southern lemon growing districts, after the marketable lemons are harvested, the trees can be sprayed with a 3:3:50 Bordeaux mixture plus half a gallon of white oil as a protection against anthracnose, black pit, and brown rot. The trunks of the trees should also be carefully examined for any signs of collar rot. Where this trouble is found, the trees should be treated instantly by cutting away all diseased parts and painting the wounds with a Bordeaux mixture made of two parts of bluestone and one part of lime, with sufficient water to make a paste.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

DURING the winter, cold conditions are the limiting factors for plant growth, therefore, the annuals which have been planted should be lightly forked around to prevent the soil from setting, and to enable the air to circulate more freely. Prepare the ground for the planting of such annuals as the lupin, scabious, dianthus, verbena, antirrhinum, wallflower, and stock. Make an early planting of gladioli and they will show flower in the early part of December. To obtain a continuity of gladiolus blooms, a planting should be made at about six weeks intervals, from July until February. The frost will not destroy the gladiolus plant, but the flowers will not open during the frosty weather.

The winter pruning should be completed, and necessary replacements of such deciduous plants as roses, flowering fruit trees, poplars, maples, &c., should be carried out without delay.

The flowering fruit trees commence to flower in early winter with the Prunus Mume, or Japanese apricot, and finish with the cherries in October. There is a wide range of flowering fruit trees to suit almost any position. They vary in size from 2 to 3 feet in height to small

trees; the colour of the blooms from pure white to brilliant red; the leaves from dark-green to bronze, and some of them give very good autumn tints.

Of these flowering fruit trees, the apple group, known as Pyrus, or sometimes as Malus, has become very popular. The flowering apple varies a good deal in regard to colour and size of flowers, colour of foliage, habit of growth, and colour and size of fruit. With these differences, it is not very satisfactory to order just a flowering apple, unless you can name the variety, or give an accurate description of it. To assist in making a selection from varieties readily obtainable from nurserymen, the following list is appended:—

Pyrus gorgeous.—This is a small type, growing about 6 feet high, and producing masses of brightly coloured fruit, which remains on the tree longer than most other varieties. The flowers and foliage are not as good as some others.

Pyrus eleyii.—This variety has rich bronze foliage, and a weeping habit. It grows about 12 feet high. The flowers have a reddish tinge, followed by clusters of fruit about the size and colour of Morella cherries.

Pyrus spectablis.—The Chinese Crab. A strong upright grower, producing clusters of large semi-double rose coloured flowers. It is an old variety, but a very good one.

Pyrus purpurea.—This is somewhat similar to *Pyrus eleyii,* but a little more pendant in its habit, while the fruit is more purplish than red.

Pyrus floribunda.—A medium sized variety, producing a mass of beautiful pink buds which open into almost white flowers. The flowers are followed by small yellowish fruit.

Pyrus angustifolia is a rather small grower, producing clusters of huge double flowers of a shell-pink colour. It does not set any fruit. There are several other varieties, but the above-mentioned are representative of the flowering apples.

Vegetables.

Although July is probably the coldest and wettest period of the year, there is a great deal of preparation to be carried out in the vegetable garden. The area not in use should be prepared for the spring sowings. It is an advantage to half trench where the root crop is going to be grown, as this gives the roots a better chance to develop. When carrying out this operation, add a liberal supply of lime to the bottom of the trench, and work in any spare vegetable matter or farmyard manure.

Make further sowings of broad beans, and when the plants reach the flowering stage, nip out the tops to encourage the pods to set better, and to prevent excessive top growth. Sow a few rows of Greenfeast culinary peas, which should be ready for picking in about fourteen weeks from the time of sowing the seed. Make plantings of Brown Spanish onions, cabbage, silver beet, lettuce, and a small sowing of early carrots.

If the perennial vegetables and small fruits have not had their winter attention, they should have it now, as they will soon be showing signs of growth. Keep the young vegetables well hoed and, about the end of the month, give the cabbage and other leafy growing vegetables, such as lettuce and silver beet, a dressing of sulphate of ammonia at the rate of about 1 oz. per 8 yards of row.

Live Stock Notes

(*Continued from page* 348).

Bees.

Bees should be disturbed as little as possible, and, if an inspection of the hives is necessary, a warm day should be selected, and the lids shut down again as soon as possible to conserve warmth within the hives. All unused supers should be removed so that the bees will be confined to as small a space as possible.

All spare combs should be examined for wax moths and, if the larvae are noticed, the combs should be fumigated with carbon bi-sulphide. The faulty combs should be removed for boiling down and pressing out the wax. Frames from which the combs have been removed should be cleaned and stored for re-wiring in August and September. If done too soon, the wires may rust before the frames are required.

The apiarist, during this month, which is not a busy one for him, should map out his programme for the coming year. (Messrs. J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.)

Grooming of Horses

By W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer.

GROOMING, or in other words, maintaining thorough cleanliness of horses' coats is not, as many people think, a mere matter of appearance, nor of a rough or smooth coat; but it is essential to the general health and condition of working animals. It must also be borne in mind that the greater the action of the skin, the greater must be the attention paid to it. In his natural state the horse does not require grooming, apart from what he gives himself by rolling. He takes a certain amount of exercise only to provide himself with food and his diet is one provided by nature. On the other hand when working, and especially if it be fast or strenuous work, the secretions of the glands of the skin are enormously increased. Furthermore, the horse which is worked hard must be fed on highly nitrogenous food, and this also greatly increases the skin secretions. Nature must therefore be assisted by artificial means, such as regular grooming, to remove these increased secretions, or the pores of the skin will become clogged and the health of the animal will deteriorate.

Let us now consider the structure of the skin and its glands. The skin is a dense, yet porous, membrane investing the whole body. It is composed of two layers, the outer, which is called the epidermis, cuticle or scarf skin, is hard and insensitive, while the under layer, the cutis or true skin, is vascular (containing blood vessels) and sensitive. These two layers are easily separated as is seen in cases of slight burns, or in vesicles raised in the form of blisters.

The cutis, or true skin, is thick and full of blood vessels and nerves, being the seat of touch, and from it the layers of cells which constitute the cuticle or outer skin are formed. Each cell is originally round, and filled with moisture; but as the moisture evaporates the cell becomes flattened, and being laid in a series of one over the other, they form the cuticle or outer skin. The outer scales are being constantly cast off in the form of dandruff or scurf, and are being just as constantly renewed by the secretions of new cells from the true skin below. This skin varies in thickness, being much thicker and tougher on exposed parts such as the front of the knee, while behind the knee it is much thinner; inside the thigh, where it is not exposed, it is very thin. There are two sets of glands below the true skin, namely, the sudoriferous or "sweat" glands and the sebaceous or "oil" glands. The former secrete perspiration, and their size varies, being very large where perspiration is excessive. The horse perspires more freely than most animals. The "oil" glands secrete an oily material, and are most numerous where there is much friction or motion in the skin, for example in the bend of the knee or the hock, and in the heels. The skin of the horse is characterized by its great sensitiveness, and this is still further promoted by grooming and by artificial protection, as in the case of the racehorse in training.

It has been estimated that a horse in hard condition and hard work, gives off through the pores of the skin as much in 24 hours as he excretes in the form of faeces or dung. This removal of waste material goes on all the time even when at rest, but, of course, is greatest when the horse is at hard exercise. It can thus be realized how essential is the care of the skin by regular grooming if a horse is to remain in health, when the skin secretes waste material at its utmost, i.e., when the horse is at work or in training.

Twice a year, in spring and in autumn, the horse sheds his coat. At these periods the hairs become detached and fall off, whilst, at the same time, new hair is formed. In autumn longer hairs are grown as a protection against the cold of winter, whereas in the spring the long hairs are shed and shorter ones are supplied for summer use. Where long hairs are worn at all times, as in the mane and tail, they are not shed at all.

The objects of grooming horses are twofold; in the first place, to remove from the skin particles of dust, dirt and perspiration, which tend to clog or impede the free action of the skin glands, and so interfere with the general health of the animal. In the second place thorough grooming removes worn-out cells,

commonly spoken of as "scurf," which although no longer required become cemented with perspiration, and thus interfere with the skin's effort to eliminate waste material.

Method of Grooming.

In order to thoroughly cleanse the skin of a horse it is necessary to employ both skill and hard work. To produce the greatest effect with a minimum of power, to make his labour of fullest value, and to perform the operation in the shortest time, the groom should add his muscular strength to his weight. He should stand well away from the horse and lean his weight on the brush, thus penetrating the coat more effectively and expending less exertion than if muscular effort alone were depended upon.

A female blood sucking horse louse.

The horse to be groomed should be cool and dry. Commencing on the near side of the neck behind the ear, the coat must be thoroughly brushed, moving the brush the way the hair lies. To remove hard dirt and scurf a circular motion may be more effective. When the near side is completed the off side, starting from the neck, should be gone over.

Having completed the body the legs should then be groomed. The horse is next turned round in the stall, and the head and mane thoroughly brushed. The eyes, nostrils, and dock should then be cleaned. The animal is then turned round once again, and the tail is well brushed out. Finally, a thorough polish is given with a rubber in place of the brush.

The feet should be lifted and cleaned out daily. Unfortunately, this is a matter which frequently is neglected. Every few days the sheath should be washed out and dried, taking the precaution not to use soft soap for this purpose.

The use of the curry-comb is not recommended for the horse's coat. Its use should be confined to the cleansing of the brush. Horses at work should be groomed thoroughly every morning before exercise and again, to a lesser extent, after exercise. A well-groomed horse will never harbour skin parasites, such as mange and lice. Such parasites will not put up with the constant disturbance brought about by the use of a brush.

Washing a horse should not be practised except to remove mud, &c., after work. In such cases, however, the animal must be dried immediately, as otherwise skin troubles such as greasy heels, cracked heels, or mud fever will soon appear. Water actually has little effect in cleansing a horse's skin, but definitely checks the action of the oil glands, and will thus render the coat dry and harsh by stopping the proper oil secretion.

In conclusion, the effect of regular daily grooming is easily recognized by the bright, clean and healthy appearance of the animal, which thoroughly repays the labour expended.

Skin parasites, which have been active on this animal, do not worry the well-groomed horse.

Lawns and Playing Grounds—*continued from page 325.*

This vegetative method of planting greens and lawns with stolons has received greatest prominence in America, and numerous varieties are available there for the purpose. The same practice is quite commonly adopted in Victoria, and at least two varieties of the true creeping bent have been commercialized around Melbourne.

Genuine seed of creeping bent is available under the name of Cocoos bent, and although this seed is expensive, it can be established successfully with a very light seeding, as the plants rapidly produce surface runners and cover any bare areas. The stoloniferous bents are usually found occurring naturally in low-lying fairly damp places, and cannot therefore be expected to succeed on well-drained higher ground without adequate watering. This creeping type of grass, on account of its abundant production of runners, tends to become rather spongy with age, and requires rather frequent topdressing with soil to maintain fresh growth and a firm surface.

Seeds Mixtures.

From the above discussion it will be seen that there are not many grasses which can be expected to give good results, and the sowing of elaborate mixtures containing seeds of a number of different grasses is not justified, and it even may lead to the introduction of undesirable kinds. Certainly there is a choice of grasses for different purposes and for varying conditions of soil and climate. The wisest plan, therefore, is to sow only the grass or grasses which it is known will succeed and which will produce a turf of the kind required.

It may be argued that if a comprehensive mixture of grasses is sown, those best suited to the conditions will ultimately survive. While this may be partly the case, it is also true that those grasses which are most successful and competitive in the early stages are rarely grasses of the most permanent type, or of the kind that produce turf of the best quality. For this reason the purchase of ready made lawn seeds mixtures of indefinite composition is not recommended.

It is wiser to buy seed of the separate kind or kinds required and to mix them in the desired proportion. Further, by so doing, seed of higher quality is usually obtained. Rye-grass and bent grass seed usually may be relied upon to germinate readily, and seed of these species retains its vitality for several years. Chewing's fescue seed on the other hand is less reliable, and care should be taken to obtain fresh seed, free from weed seeds, and it should not be kept for any considerable time before being sown.

In the following specimen seeds mixtures, the seeding rates give the amount of seed of each kind to be included in a mixture for the sowing of 100 square yards of lawn. The seeding rates given are somewhat lighter than are sometimes recommended, but with average quality seed and a properly prepared seed bed they are known to be adequate.

STANDARD MIXTURE FOR FIRST QUALITY FINE LAWN.

	lb.
Chewing's Fescue	5
Brown Top (N.Z. certified)	2

This mixture is also suitable for bowling greens and golf greens. The inclusion of any other grasses in this mixture not only is unnecessary but also impairs the quality of the turf produced. The cost of establishing such a lawn may be reduced by omitting the fescue altogether, in which case the brown top seeding rate may be increased to 3 lb. per 100 square yards. If water supply is limited and for warmer conditions, substitute dryland brown top for ordinary brown top.

FOR RAPID ESTABLISHMENT ON HEAVY FERTILE SOIL.

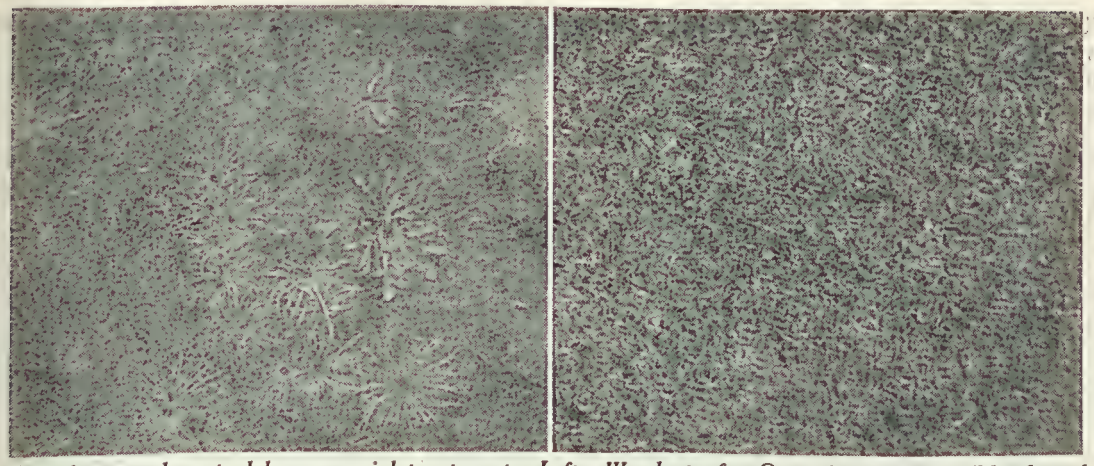
	lb.
Perennial rye-grass (N.Z. certified)	10

BACK LAWN, LARGE SCALE LAWN, OR PARK.

	lb.
Perennial rye-grass	8
Kentucky blue grass	2
Brown top	1
White clover	½

For drier conditions include couch grass, 1 lb. Mixtures containing couch are best sown in the spring, as this grass requires warm, moist conditions for germination. Where considerable areas are to be sown, a mixture compounded in the above proportions may be sown at a reduced rate.

For tennis courts a pure sward of couch grass makes the best turf, as grass courts are not normally used during the dormant period of this species. Couch usually is established by



Showing weed control by manurial treatment. Left.—Weedy turf. Organic manures (blood and bone) only. Right.—Clean turf. Manurial mixture including superphosphate, sulphate of ammonia and sulphate of iron. Both plots were sown with the same seeds mixture four years ago and have not been hand weeded.

chopping up and planting the runners, but may be grown from seed if sown in November and carefully watered until established.

Manurial Treatment of Lawns.

Perhaps no single factor is more important in deciding the fate of a lawn than is the manurial treatment which it receives, both before and after sowing. The use of a good topsoil and its careful preparation before sowing will simplify the problem, but even so the maintenance of a fine quality lawn in good weed-free condition requires constant care and attention. The adoption of a systematic scheme of manurial treatment right from the time of sowing will enormously reduce the amount of time spent in hand weeding, and at the same time improve the vigour, density and appearance of the sward. One comes across such widely divergent recommendations as to what manures or fertilizers should be applied to lawns, that some discussion of the principles involved is necessary before making fresh recommendations.

There are usually only three plant foods which require to be supplied to maintain soil fertility—nitrogen, phosphate, and potash. On normal soils potash is not often deficient, at least so far as the requirement of the turf grasses is concerned, leaving only nitrogen and phosphate to be considered. In addition to the mere supplying of the necessary plant foods, there is another important phase of the maintenance of turf—the control of weeds. In most cases, that is where a pure grass sward is the objective, clovers must be classed as weeds.

The maintenance of a mixed sward of grasses and clovers is a relatively simple matter, requiring only the application of adequate phosphate to encourage clover growth. An annual application of superphosphate at the rate of 3 to 4 lb. per 100 square yards is sufficient for this purpose. The clover growth induced will in time build up the nitrogen reserves in the soil, and soil fertility is not only maintained but also improved. Where clovers are eliminated this cheap and convenient source of nitrogen is eliminated along with them, and if grass growth is to be kept going, adequate nitrogen must be regularly applied. Emphasis is laid on the necessity for making regular applications of nitrogenous manures at fairly short intervals.

Nitrogenous manures, particularly in the inorganic form, are rapidly taken up by plants, and it is not possible to supply say a full year's needs in a single application. An attempt to do so would produce an enormous flush of growth, followed by a long period of greatly reduced growth. Large doses of inorganic fertilizers may also result in severe scorching of the turf.

In addition to regular supplies of nitrogen, a pure grass sward requires a regular but constantly available supply of phosphate. This is a fact which is often not fully appreciated in the manurial treatment of pure grass lawns. A shortage of phosphate will result in the grass becoming thin and open, as a result of reduced production of new shoots. A phosphate-starved turf also develops a curious bronzed colouration, which is most noticeable during the winter.

These plant foods, nitrogen and phosphate, may be applied either as organic (natural) or inorganic (artificial) manures, the difference between the two classes being largely a matter of weed control. The organic manures have no value whatever for the control of weeds and clovers and their exclusive use must entirely fail to produce a clean and weed-free turf. Of the inorganic fertilizers, sulphate of ammonia stands above all others as a weed controlling agent, and is also a cheap and convenient means of applying nitrogen. The use of a small quantity of sulphate of iron in conjunction with sulphate of ammonia gives improved weed control. Phosphate is most conveniently applied as superphosphate, an annual dressing at 3 lb. per 100 square yards being sufficient. If used in combination with sulphate of ammonia and sulphate of iron, there need be no fear that the application of super. at the above rate will unduly encourage clover growth.

The following schedule of manurial treatment is recommended for a garden lawn (quantities in lb. per 100 square yards):—

	lb.
March—	
Superphosphate	3
Sulphate of ammonia ..	4½
Sulphate of iron	1½
June—	
Sulphate of ammonia ..	4½
September—	
Sulphate of ammonia ..	4½
Sulphate of iron	1½
December—	
Sulphate of ammonia ..	4½

It is not suggested that this schedule should be slavishly followed for the entire life of a lawn, but it is recommended for adoption for the first two or three years, the application for March (with the omission of the sulphate of iron) being taken as the treatment at sowing time.

Poor soils may be enriched by the digging-in of some bulky organic manure, or the growing and digging-in of a green manure crop, before the lawn is sown, but some sulphate of ammonia should always be applied at seeding time to ensure a rapid establishment of the grass. The continuous use of heavy applications of sulphate of ammonia and sulphate of iron may in time result in a hardening of the surface soil, accompanied by a reduction in its water holding capacity, and as soon as the lawn becomes reasonably free of weeds, the use of sulphate of iron may be discontinued and the amount of sulphate of ammonia applied gradually reduced, the balance of the nitrogen supply being provided by the use of organic nitrogenous manures such as castor meal, malt combings, blood manure, &c. A careful watch should be kept, however, for any increase in the weed population, and at no time should the use of sulphate of ammonia be completely discontinued.

Organic manures, because of their generally lower nitrogen content, are used at rates exceeding that given above for sulphate of ammonia. To enable the correct use of these manures the following substitution table is provided, showing the number of pounds of each of the common organic manures to substitute for 1 lb. of sulphate of ammonia in order to supply the same amount of nitrogen. The figures cannot be exact, as the nitrogen content of these manures varies somewhat, but an approximate average figure for each (as stated) is used as a basis for calculation.

Manure.	Average Nitrogen Content.	Pounds to Replace 1 lb. Sulphate Ammonia.
	Per cent.	
Sulphate of ammonia	20·6	1
Blood and bone ..	5·5	3·7
Dried blood ..	12·0	1·7
Blood manure ..	8·0	2·6
Castor meal ..	4·5	4·6
Malt combings ..	3·5	5·9

The organic manures are less rapidly available than is sulphate of ammonia, and are therefore slower acting, but they produce a more lasting response. The mixing of some organic manure with sulphate of ammonia will therefore lengthen the period over which a response is obtained from a single application.

Lime for Lawns.

In a general way it may be said that the application of lime to lawns, or to ground to be planted with lawn, is not recommended. It is a well-known fact that the true turf grasses are able to grow well on acid soils, and in fact in their native habitats the soil is invariably of an acid nature. One important factor in the control of weeds in lawns is the ability of the turf grasses to withstand a greater degree of soil acidity than can many of the common weeds, so that a somewhat acid soil condition is definitely desirable, and care should be taken not to destroy this condition by the indiscriminate use of lime. Extreme conditions may of course exist, or be induced by heavy applications of sulphate of ammonia and sulphate of iron, and need correction by liming but, excepting these extremes, the

application of lime to lawns is likely to do more harm than good. If, after a number of years, it is noticed that the lawn is ceasing to give a normal response to applications of sulphate of ammonia, it may be given a dressing of lime equal in amount to the total amount of sulphate of ammonia which has been applied over the period.

Spreading of Manures.

One of the greatest difficulties experienced by amateurs is to achieve an even spread of the materials applied to lawns. Sulphate of ammonia and sulphate of iron in particular produce a very visible response—visible both as increased growth and changed colour, and a patchy result mars the appearance of the lawn. The exact amount of each ingredient to be applied should be calculated according to the yardage to be covered, weighed out and, if lumpy, worked through a sieve. The separate ingredients may then be thoroughly mixed together and mixed into a larger quantity of sand or dry sandy soil.

This mixture should then be divided into four equal parts and the whole lawn gone over four times, each time walking in a direction at right angles to the last, and broadcasting the material by hand, throwing it with a definite scattering motion, and on no account attempting to sprinkle it on. Sulphate of ammonia causes slight scorching of the leaves, and sulphate of iron, especially if applied while the grass is damp, results in some blackening. Both results are, however, temporary and need not cause alarm. Both chemicals are capable of doing severe damage if used rashly, and for this reason the elimination of all lumps from the mixture before broadcasting is most important. Neither chemical should be allowed to come in contact with the leaves of other garden plants.

Renovation and Topdressing of Existing Lawns.

Most lawns will show a rapid improvement if given the manurial treatment as outlined above. Where, however, weeds and particularly clovers are abundant, a mixture of 3 parts of sulphate of ammonia and 1 part sulphate of iron should be given in three applications of 6 lb. per 100 square yards, at intervals of four to five weeks, before starting on the manurial schedule proper. Very weedy lawns, especially those containing taprooted weeds, such as docks, carrot weed, and flat weed and unwanted grasses such as water couch and paspalum are most effectively,

Spreading manures on turf manurial trials.

and probably most economically, dealt with by digging, thoroughly cleaning the ground, and reseeding.

The regular topdressing of playing greens with soil is necessary to true up the surface and to enable repairs to be made and fresh seed to be sown on the worn areas. On garden lawns, however, this frequent topdressing is not necessary. Creeping bent lawns do respond to regular topdressing, but a correctly manured brown top lawn will remain in good condition with only a very occasional application of soil.

A common mistake in the topdressing of lawns is the spreading of too thick a layer of soil. The grass should never be completely buried, but the soil applied thinly and worked in with the back of a rake so that the leaves can still be seen showing through. The benefit of topdressing is increased by giving the lawn a heavy raking followed by a close mowing before spreading the soil. Such treatment will slightly loosen the surface and will remove any old dead grass and lift runners of creeping grasses and weeds to be cut off by the mower. Such treatment, far from damaging the true turf forming grasses, will stimulate the production of the fresh shoots, on which a lawn depends for its maintenance, in a dense leafy condition.

The rolling of lawns, as distinct from bowling greens and tennis courts, is regarded as being neither necessary nor desirable. Minor surface irregularities can be adjusted by topdressing, and larger mounds and depressions cannot be disposed of by rolling. Where such occur the only remedy

is to remove the turf from the affected areas, level the exposed soil, replace the sods, and finally true up the surface with a light topdressing of soil.

Watering and Mowing of Lawns.

To reap the full benefit of all the other work of establishing a lawn, careful attention to the details of watering and mowing is necessary.

It is quite possible for a well tended sward of the coarser grasses and weeds to look more attractive than does a neglected lawn of the better turf forming grasses.

Under Victorian climatic conditions the necessity for regular summer watering is generally accepted. All lawn grasses, including those described as drought resistant, require adequate watering during dry periods to keep them green and vigorous. The difference between the drought resistant and the non drought resistant grasses lies more in the ability of the former to survive severe dry spells without death, but in a more or less dormant condition, rather than in any ability to maintain vigorous growth without water.

In applying water to lawns it is desirable to wet the ground as deeply as possible, and for this purpose the practice of heavy watering at intervals of a few days is better, and more economical, than is a daily light watering. The length of time between waterings will of course depend on the weather conditions prevailing and on the depth of the root system of the grass. Couch grass, with its deep roots, is able to carry on for a much longer period on a single good watering than is brown top, with its more surface growing habit. Dryland brown top, with its well developed underground runners, holds on better and is less likely to suffer permanent damage if allowed to brown off, than ordinary brown top, but it also requires abundant water to keep it green and leafy during hot, dry weather. The deeper penetration of water can often be encouraged by forking during the summer, particularly on slopes and areas which tend to become hard and impervious.

The degree of closeness and frequency of mowing to which a lawn is subjected will have an important bearing not only on its appearance, but also on its botanical composition. The true turf forming grasses have either a crown which is set low in the ground, or well developed surface or underground runners, and are thus able to withstand constant keen mowing without serious damage. The coarser, higher crowned grasses like perennial rye-grass, on the other hand, are damaged and gradually die out under very close and regular mowing. Garden lawns are not usually mown as closely as are golf and bowling greens. It has been found, however, that a brown top, or brown top and fescue lawn, forms a denser and cleaner turf if fairly closely and frequently mown, than if allowed to grow longer and mown less frequently.

The mowing practice which is most damaging to a fine lawn is infrequent but severe mowing. If the grass is regularly allowed to grow long leaves and then is cut close to the ground in one stroke, an open and weak turf will result. The best method is to mow to a constant height as frequently as possible, as such treatment stimulates the production of new shoots and maintains, with proper manurial treatment, a dense and vigorous sward. It is desirable to leave the grass a little longer during the hottest part of the year, but any change in the closeness of mowing should be effected gradually. If by any chance the grass is allowed to become abnormally long, it should not be cut down to the normal height in one cut, but reduced a little at each cutting until the usual height of cut is reached.

It is usual to catch the clippings from a lawn in a container attached to the mower, and not allow them to fall back on the lawn. If the clippings are allowed to fall, they form a mulch which tends to keep the ground moister, and as they decay, provide a certain amount of plant food. During winter, and in damp weather in spring, the clippings do not quickly disappear, and tend to collect in damp masses which may cause local damage to the grass as they decay. During the summer the clippings rapidly wither and are absorbed into the turf, and their mulching effect at this time of the year is of value. The clippings may, therefore, be allowed to fall in the summer without disfigurement and with benefit to the lawn, but at other periods, and particularly in wet weather, it is best to box and remove them.

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Sheep Husbandry

Its Relation to Disease Control

By A. R. Grayson, B.V.Sc., Veterinary Officer

THE sheep industry in all its phases of wool, mutton, and fat lamb production, together with its associated secondary products, is of paramount importance to Australia. Looking back, we realize that in the relatively short time during which Australia has been developing her sheep industry, great progress has been made—in the clearing of bush country, in the establishment, improvement, and management of pastures, in the use of artificial fertilizers, in the selection, improvement, and standardization of sheep breeds as well as in our knowledge of sheep diseases.

We also realize that, in the future, still further advancement along all these lines will be made. The problem which confronts all sheep owners to-day is the way, or ways, in which modern knowledge — particularly in regard to sheep diseases—may be applied towards not only the scientific, but also the economic management of their flocks. It will be the aim, in this article, to indicate, how, in the light of our present knowledge, ordinary, routine procedure in sheep management may be carried out with a view to disease control.

Practically throughout the whole of Victoria, where rainfall conditions are suitable, or where irrigation can be practised, pasture improvement, associated with the application of superphosphate and the introduction of better grasses and clovers, has come into general use. By this means the land has been rendered more productive, and the volume of seasonal growth has been much increased. This extra growth, together with the conservation of surplus fodder, has considerably increased the carrying capacity of the land. Associated with this increase in the rate of stocking, and perhaps largely in consequence of it, is an increase in the incidence of the various diseases amongst sheep. This fact, in itself, provides sufficient reason for the closer and more painstaking attention to those details of sheep management which tend to lessen the risk of these diseases or to minimize their effects.

One aspect of sheep management which has received considerable prominence of later years is that relating to the mineral requirements of sheep, and the mineral contents of pastures. Briefly, the mineral elements which are of major importance to animal life—though not necessarily in the order of importance—are calcium, phosphorus, sodium, and chlorine. The importance of these named minerals is perhaps quantitative, as mere traces of other minerals are equally essential to life. The importance of the four named minerals is bound up in the development of the skeletal structure, the maintenance of acidity and alkalinity of body tissues, the proper functioning of cell metabolism and the removal of waste products from the body cells. It is in respect to these two latter functions that the sodium and chlorine elements have their primary importance.

The diet of sheep normally contains sufficient calcium and phosphorus for the maintenance of health, providing the soil has a normal content. This applies practically throughout the whole of Victoria. The application of superphosphate increases the phosphorus content of pastures in the form of protein phosphates and roughage—particularly leguminous roughage—has a fairly high calcium content. It would therefore appear that the provision of licks for sheep containing either di-calcic phosphate or bone meal and other minerals becomes an unnecessary expenditure in the greater area of Victoria. Recent experiments conducted by the Council for Scientific and Industrial Research indicate that the returns obtained do not justify the expense involved. It would further appear that the minerals most often lacking—sodium and chlorine—can be cheaply supplied by the provision of common salt. The feeding of molasses is also recommended, primarily because of its food value and also, because, as will be seen later, it does have a definite value in the preventive control of some disease conditions. It might be mentioned here that molasses is now obtainable in a solid or block form, and it is preferable to supply it in this form rather than to mix it with salt. When mixed with salt some sheep, because of their partiality to the molasses, may get an excess of salt.

Routine Operations.

In regard to distinctive disease conditions as such, it is well recognized that different diseases are met with during different periods of the year, and amongst different classes of sheep, i.e., lambs, weaners, adult sheep, &c. Similarly at different periods of the year different and regular routine operations are carried out. Can these routine operations be so conducted as to really become methods of prevention of disease?

The first operation conducted during the lifetime of the sheep is that of lamb-marking. The use of temporary yards, erected in the paddocks on which the ewes and lambs are running, the carrying out of the operations in mild weather, and then only in the morning and early afternoon to ensure proper mothering of the lambs, the thorough and frequent sterilization of all instruments and the hands of the operator, the careful handling of the lambs, are all recommended as being likely to lessen mortalities, either as a direct result of the operation, or as the result of after-infection. The preventive inoculation of lambs against entero-toxaemia (pulpy kidney) can be carried out at the same time as lamb-marking.

Entero-toxaemia is the next trouble most likely to affect the young lamb. It is well to bear in mind, however, that while in Victoria most losses from this disease, more commonly known as pulpy kidney, occur amongst young lambs, losses amongst adult sheep are by no means rare. Entero-toxaemia is caused by the toxins produced by the rapid multiplication, in the sheep's intestines, of an organism that is a more or less normal inhabitant of that region. It is known also that a condition of bowel stasis, i.e., a sluggishness of the bowels, is a predisposing factor towards the multiplication of the organism and the liberation of the toxin. The main stimulants to peristalsis or bowel movement in sheep are exercise, and fibre or cellulose in the fodder. Knowing these facts, we can then adapt the management of the growing lambs towards preventing the onset of this disease.

The feeding of fibre in the form of chaff or hay as a supplementary ration, even in the flush of the season is recommended, for, even at this flush period, ewes and lambs will partake of dried feed if it is provided. Where meadow hay is the main conserved fodder, the practice of building stacks in the paddocks in which the ewes and lambs will be grazing will make it easier to feed to the sheep. The system of rotational grazing with its consequent frequent movements from paddock to paddock will, in some measure, provide exercise. Failing this, compulsory gentle exercise should be given the flock. The destruction of all carcasses, by burning if possible, is a definite control measure against this as well as other diseases, and this practice should be rigidly adhered to.

Internal Parasites.

No animal suffers more severely from internal parasites than does the sheep—particularly the young sheep. This fact is associated with its close grazing habits and with the modern methods of sheep-raising. Even in dry areas sheep are not entirely free from parasites, but where the annual rainfall exceeds 20 inches—or in irrigation areas, worms may become very serious. Moisture is essential for the development of larval worms in pastures, and consequently outbreaks are chiefly depen-

Sheep grazed on a highly nutritive pasture can withstand heavier infestations of internal parasites than sheep on poor pasture.

dent on the rainfall. Losses from worms are not to be measured solely by mortalities. Such ill effects as failure to grow and fatten, loss of condition, and decreased wool values must also be taken into consideration.

Our knowledge of the life histories of internal parasites or worms, including liver fluke, shows that there are certain factors which influence the development of the eggs and larvae in the pastures, and factors which affect the resistance of sheep to infection. In the light of this knowledge certain principles of control of parasitism may be laid down. This control does not necessarily aim at the complete eradication of all internal parasites, which, under the normal conditions of sheep-raising, would be practically impossible, but rather at keeping their numbers below the point at which they become harmful. These principles are as follows:—

Avoid overstocking, which by its consequent close grazing greatly increases the chances of infestation.

Avoid Damp and Marshy Pastures.—Where possible these areas should be drained, or, if this is not possible, they should be fenced off, as should also all dams and watering places. Troughs for watering the stock should be supplied, and they should be cleaned regularly.

Rotate the Grazing of Pastures.—Where practicable this is an excellent system of control. The animals are kept moving from pasture to pasture so that they do not remain on any one paddock sufficiently long to grossly contaminate it. Rotation should be continued in the one direction.

Periodic Firing or Cultivation of Pastures.—Burning-off of worm infested pasture is one of the best means of destroying larval worms. Where burning-off is not practical, cultivation of the paddock, with its consequent enforced spelling, is equally advantageous.

Nutrition.—This is a very important factor in the control of parasitic diseases. It has been shown definitely that sheep on a highly nutritive pasture or ration can withstand much heavier infestations than can sheep on poor pasture. Although this is so, a limit to the carrying capacity is eventually reached, and if exceeded, serious losses may occur. On all pastures, whether improved or natural, the provision of a supplementary ration such as meadow hay, lucerne, oaten chaff, or grain is recommended.

Although the principles outlined above do form an effective means of control, systematic treatment is, however, the main line of defence.

Methods of treatment for the various parasitic and allied diseases, i.e., black disease, &c., are dealt with elsewhere and will not be outlined here. It is essential to remember, however, that where treatment is indicated, it should be applied to every member of the flock, and not confined to those sheep which appear to be infested. Further, it is bad management to

wait until the sheep are so badly infested as to appear noticeably ill. By judicious, regular, and systematic treatment the infestations can be kept so low that serious outbreaks do not occur.

Foot-rot.

Another disease with a seasonal incidence, and which, in wet years, can assume serious importance is foot-rot. Sheep husbandry can play an equally important part in the control of this disease. While discussing foot-rot, it must be remembered that the term has been loosely applied to all conditions of the feet of sheep which are associated with pus-formation and lameness. Recent investigations by officers of the Council for Scientific and Industrial Research have proved that although outbreaks of true foot-rot occur only under favorable seasonal conditions, the disease is, nevertheless, specifically contagious, and therefore cannot occur except when the specific causal agent is present. It has also been shown that the causal agent cannot survive longer than a few weeks, at most, on pastures, apart from the sheep, and therefore the removal, during summer, of all sheep carrying the infection should entirely free the flock and the property from this trouble. When the infection has thus been eliminated, the disease will not recur unless introduced from outside sources.

To prevent re-infection it would be necessary to carefully examine, during the late summer, the feet of all sheep on the property, and isolate immediately all animals showing chronic lesions. During this examination all mis-shapen feet should be pared. As an additional safeguard all sheep should be passed through a suitable foot bath. If a large number of sheep is affected it may be necessary to make two examinations, with an interval of about four weeks between them.

Sheep isolated at either examination should be treated and not returned to the flock until a month has elapsed after they have been completely cured, or, in some cases, it may be convenient to kill them or sell them for slaughter. Pasture on which infected sheep had been grazing should be kept free from sheep for a period of preferably three to four weeks before clean sheep are put on it. All introduced sheep should be similarly carefully examined and treated, and kept apart from the main flock for a period of at least three to four weeks after the complete cure of any case. Such control measures, as well as being effective against true foot-rot, will also minimize the incidence of such conditions as scald and digital suppuration (foot abscess).

Nutritional Diseases.

There are two disease conditions in pregnant ewes, both of which are nutritional in nature and in both of which the essentials in prevention are closely wrapped up in good breeding ewe husbandry. The first of these is pregnancy toxaemia or, as it is often termed, twin-lamb disease. This is a non-contagious condition which occurs in pregnant ewes shortly before lambing, and ewes carrying twin lambs are more likely to be affected. As already indicated, it is nutritional in nature, and generally

Hand-feeding plays an important part in reducing the incidence of nutritional diseases in sheep.

occurs in ewes that are falling away in condition, as a result of an inadequate food supply for the needs of the ewe and the rapidly developing lamb or lambs.

In these cases it would appear that the onset of the condition is due to glycogen being withdrawn from the liver to maintain the blood sugar level, and to fat taking its place. At times the condition has been seen in fat ewes that are well fed on rich pastures. In these cases the onset is associated with lack of exercise. In both instances it will be seen that the disease is, at least, partly due to the incorrect feeding and management of the pregnant ewe.

Consequently rational management should be practised throughout the whole of the in-lamb period. The ewes should be kept in good condition by judicious feeding, but not allowed to become over-fat. They certainly should not be allowed to suffer as the result of malnutrition. Allowing the ewes to run on poor pasture and then placing them on very good feed just prior to lambing is as equally bad a practice as is the converse. The question of the hand-feeding of in-lamb ewes should receive greater consideration, particularly with a view to providing a balanced ration. The ewes should not be confined in a small area of good pasturage, but should be allowed a large enough run for exercise while obtaining their food. When hand-feeding, the ewes should be fed in a different place each day to prevent them standing about in the same area waiting for the feed to be put out. By adopting this practice the sheep will obtain natural exercise. As a means of preventing the onset of this condition the feeding of molasses, which has a high food value in relation to its sugar content and also a laxative action, is recommended.

The second of these nutritional diseases is hypocalcaemia, sometimes termed milk fever in ewes. This condition affects both pregnant and lactating ewes, and is characterized by either an insufficiency of calcium or a disturbance in the calcium-magnesium balance in the blood serum, or both. As a means of controlling the incidence of this condition, which is more commonly seen in lactating ewes on soft luscious pasture, the provision of a balanced ration during pregnancy is advised. Here again the feeding of molasses, which has both a high calcium and a high magnesium content, is undoubtedly beneficial.

Mention was made earlier in this article when discussing mineral requirements of the part played by minerals in maintaining the acidity and alkalinity of body tissues. Recent research work into toxaemic jaundice of sheep has shown that this condition is primarily due to an upset in the copper content of the body, and that the onset of the jaundice symptoms is preceded by a marked rise in the copper content of the blood stream. Further work has shown that when the blood stream can be kept alkaline, a reasonably high percentage of sheep recover. It is consequently advised that in known toxaemic jaundice areas a lick consisting of two parts salt, one part calcium carbonate, and one part sodium bicarbonate be provided for the sheep.

It will be noted that remedial measures against any disease mentioned have not been discussed in this article. It has been the aim solely to point out various control measures which can be, and should be, readily and regularly practised in good sheep management.

Fertilizers Act

Prosecution for Offence

At the Sunshine Court of Petty Sessions, on 12th of July, 1940, before Mr. Pyvis, P.M., and a bench of local Justices of the Peace, Albert George Pennell, fertilizer manufacturer, was fined £3, with £3 10s. costs, for violating section 7 of the Fertilizers Act in failing to affix labels to bags containing artificial fertilizer. A charge under section 5 of the Act was dismissed with £2 2s. costs on the ground of insufficient evidence. A case under section 16 was withdrawn.

Invigorating Fruit Trees by Inarching

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor and F. J. Greatorex, Orchard Supervisor.

FOR many years inarching has been practised as a means of invigorating debilitated trees in various parts of the world. The operation is not new to Victorian horticulture, having been successfully used by the late Mr. D. Fithie, of Box Hill, approximately 35 years ago, and it was most probably used by even earlier horticulturists. The principal use for which it was employed was to change the existing rooting system for one of a more vigorous type, and in some cases with pear trees this entailed substituting a pear seedling root-stock for the already established quince root system.

About 1895 Mr. Fithie planted in his orchard an acre of Glou Morceau pears worked on quince root-stock. Glou Morceau, Beurré Hardy, Beurré Diel, and Doyenné du Comice, are compatible with quince, and these combinations produce fairly satisfactory trees, whereas the majority of the other varieties

Fig. 1.—A Glou Morceau pear tree originally worked on quince root-stock inarched with pear seedling 35 years ago.

Fig. 2.—Close up of trunk of tree shown in Fig. 1. Note the quince root-stock completely rotted away. Inarched pear seedling on right.

worked on quince root-stock are decidedly dwarfed and commercially unsatisfactory. Some ten years after planting, Mr. Fithie realized that these trees would not have the life and vigour of those on pear seedling root-stock, and he therefore inarched one pear seedling in each tree. The effect of these inarchings can be seen in the accompanying illustrations. In one case, Figs. 1 and 2, the quince root system has rotted away entirely, its functions having been taken over by the inarched pear seedling. Fig. 3 shows another tree in the same area and treated in a similar manner, in which the quince and the inarched pear seedling root system are functioning side by side.

The practice of inarching seedlings into established orchard trees could be more widely employed by Victorian orchardists in cases where trees are stunted by dwarfing root systems. For example the Granny Smith apple

Fig. 3.—Trunk of Glou Morceau pear tree showing pear seedling inarched on the left and the original quince root-stock surviving on the right.

in most parts of Victoria grows unsatisfactorily on Northern Spy root-stock, except when root-grafted and scion rooting takes place. Where poor growth of the variety due to root-stock influence is experienced, the inarching of selected apple seedlings should be practised.

Method of Inarching.

Selected, vigorous apple or pear seedlings, as the case may be, should be planted during May and June as close as possible to the trunk of the tree to be inarched. It is advisable to use two or three seedlings placed at equal intervals around each tree.

In many instances where inarching has been practised, both the original and the inarched root-stocks continue to function side by side. Whether this occurs, or whether one root-stock ultimately dominates, appears to depend on the difference in vigor between the root-stocks.

A more desirable type of vegetatively raised plant, for example, the vigorous Paradise root-stock, East Malling No. XVI., has been suggested by Hearman *et al* (1) for inarching into apple trees. The advantage of using this standardized root-stock will be apparent, but unfortunately no research work has yet been undertaken on the compatability of this stock for Victorian varieties and, as no supplies of it are available in this State, vigorous selected seedlings are recommended.

The existing root system of the established tree, particularly if it is old, affects the position in which the seedling can be planted, and this in turn determines within fairly narrow limits the point on the trunk where the inarching can take place. Hearman has shown that if a single inarch is made in some positions on the trunk, only portion of the tree, in the first few years, may be invigorated. Lacking a detailed knowledge of the tree's anatomy the grower may find it difficult to decide upon the best place for the inarch, and therefore it is suggested that three seedlings be used, spaced as evenly as the existing root system will permit, around the trunk.

The operation can be performed in the spring as soon as the bark will lift easily from the wood. For pears, this period extends from about the middle of September until mid-October, and in the case of apples from mid-October to mid-November.

Two methods of inarching can be used. In one case, Fig. 4, an inverted "T" (⊥) cut is made in the bark of the trunk about 12 to 18 inches from the soil level. It is advisable to gouge out a small piece of bark just below the

Fig. 4.—The inverted "T" cut method of inarching, showing the sloping cut on the seedling (about natural size) and the completed operation before sealing.

junction of the horizontal and vertical cuts so that the stem of the seedling will lie as close as possible to the bark of the trunk. For this method the seedling is prepared by making a single, sloping cut about 1½ to 2 inches long on the side facing the trunk. This cut end is then inserted under the raised flaps of the inverted "T" cut in the trunk. The seedling can be held in position by two ⅝-in. brads through the flaps of bark or by binding with raffia or twine around the trunk.

In the second method, Fig. 5, two vertical parallel cuts 1½ to 2 inches long are made in the trunk at the same height as that stated in the first method. The width apart of these parallel cuts will depend on the thickness of the seedling. Across the top and bottom of these two cuts, two further cuts are made, and the oblong piece of bark is lifted out. The top of the seedling is then cut off at a point about three-quarters of an inch higher than the top of the prepared area on the trunk. On the side of the seedling facing the trunk a sloping cut is made commencing at a point opposite the bottom of the prepared area on the trunk. On the opposite side of the seedling a bevel cut is made about half an inch long, and this wedge-shaped end is then pushed under the bark at the top of the prepared area. The long cut on the seedling should then lie in the area from which the bark has been removed, and the seedling can be held in place by a single brad through the seedling. The bevelled cut on the top of the seedling can be inserted more easily below the bark at the top of the prepared area or "slot" if the vertical cuts are continued about half an inch higher than the top horizontal cut thereby forming a flap of bark.

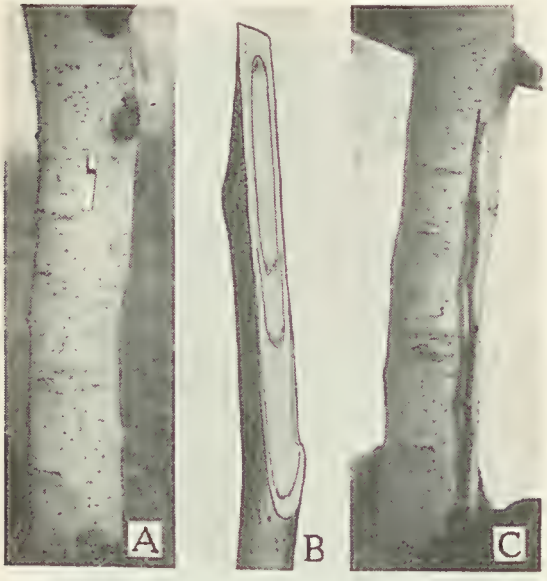


Fig. 5.—The "slot" method of inarching. A.—The slot prepared in the trunk—note top flap of bark. B.—Preparation of the top of the seedling showing long cut, but note also short sloping cut on left side. C.—Completed inarch before sealing.

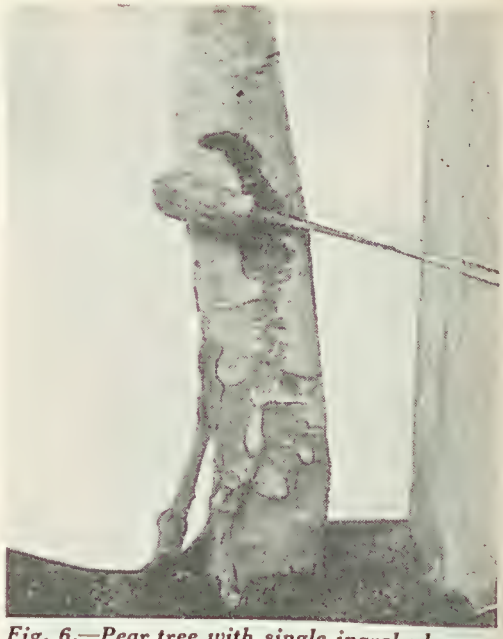


Fig. 6.—Pear tree with single inarched pear seedling, one year after inarching. In this case the inarching has been performed lower than is recommended.

Sealing and Subsequent Treatment.

The grafts should then be sealed with any one of the usual sealing waxes. Resealing at a later date may be necessary, and if raffia or string has been used for binding it should be cut.

If the seedling produces shoots, these should be curtailed by pinching or topping, but in the first year they should not be removed entirely. Later, these growths can be removed.

The seedlings are planted so close to the trunk that they may suffer from drought during their early life and, therefore, for the first two seasons it is suggested that when necessary they should be watered, and the soil around them lightly cultivated.

Reference.

(1) Joan Hearman, A. Beryl Breakbane, R. G. Hatton, and W. A. Roach.—*Jour. Pom. and Hort. Sc.*, XIV., No. 4, January, 1937.

Dairy Calves

Rearing, Feeding, Management

By A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

THE first step in rearing calves is the selection of the parents, because every calf that is reared should be well bred. Considerable expense is involved in bringing a calf to maturity, and the farmer should demand some guarantee that those calves which he rears will become profitable animals. On the dairy farm where a dairy breed is maintained, it is very doubtful if it pays to rear male calves other than those required for stud purposes. In recent years quite a good market for bobby calves has been developed, and it usually pays to sell all the unwanted bull calves as soon after they are born as possible. For several years most of the heifer calves were being offered for bobby veal; this led to a serious shortage of cows in 1939, with the result that cows have increased considerably in price, and farmers should realize the urgent need for rearing a sufficient number of heifers for replacement purposes.

In a well-managed herd, the average replacements will be 16 per cent., or one cow in every six, but it is found that in many herds the wastage is tremendous, and as much as one-third of the herd has to be replaced annually. In the herd where the farmer aims at a very high level of production and culls all the medium and low producers, most of the heifer calves must be reared for replacement. A survey of the records at the State Research Farm, Werribee, between 1928 and 1939 inclusive, showed that for every 100 cows there were 48 heifer calves dropped annually, and of these 36 (75 per cent.) were reared for replacement purposes and herd improvement. Sixteen of these 36 heifers were absolutely necessary for replacing sixteen cows that died or were culled; thus, there have been available twenty heifers for replacing the lower producing cows and further improving the herd.

Selection of the Parents.

The farmer who keeps records finds out which are his best producing and best breeding cows, and all the heifer calves from these should be reared and retained for replacement purposes. The selection of the herd sire should receive much consideration, because where a cow usually drops only one calf a year, or one heifer calf every second year, a bull will leave up to 60 or more calves a year, and his influence will thus be conveyed to many more calves than would be the case with any one cow in the herd. Where a proven sire is unprocurable, the best bull with which to head the herd is one from a cow which is not only a good producer herself, but has daughters which are also good producers. Herd sires must also conform to the *Cattle Breeding Act* 1938.

It is customary to mate the majority of cows in a herd to calve just prior to the commencement of the new season's growth of pasture so that the most profitable milk and butter-fat yields will follow, and it is found that calves do well irrespective of the time of year that they are born, although calves dropped in the autumn and winter do best under ordinary farm practices. All of these early heifer calves should be reared.

The Pregnant Cow.

In the early stages of pregnancy any good method of feeding and management is satisfactory for the proper development of the foetus. It is usually after the cow has been

dried off that feeding and attention are neglected, and most farmers arrange to have their cows dry during the worst season of the year, that is, in the winter in very cold, wet districts, or in late summer–early autumn in early districts.

This is a very sound economical practice when the dry and heavy-in-calf cows are liberally fed on some good quality home-grown roughage, such as grass hay, because maximum use is made of the pasture for milk and butter-fat production. But there is still a tendency to neglect the feeding of these cows, with the result that they cannot nourish their unborn calves properly and build up sufficient reserves of energy, protein and minerals for another successful lactation period. Pasturage and good roughage are the best fodders for pregnant cows.

Calving Time.

When the cow is springing, she should be placed in a clean, well-sheltered paddock handy to the farmstead and reserved for the springers. The cow will then be able to calve without interference by other stock, and under the observation of the farmer. In the majority of cases, cows calve without assistance; in fact, every cow should be left alone during parturition, unless the attendant has good reason to believe that assistance is required.

The Newly-born Calf.

The natural thing for a cow to do after calving is to get up and lick the calf. The licking not only cleans the calf and ruffles the hair, but stimulates breathing and circulation. When the calf is not licked by its mother, it should be rubbed dry with a chaff bag or other suitable cloth. After being licked, the calf usually gets to its feet and seeks its first feed from the mother; this first feed of the mother's milk (colostrum) is essential, and all calves should be left with their mothers long enough to have it.

The growth and development of the calf is largely dependent upon its feeding and management during the first week or ten days of its life; checks during this period are frequently permanent, and leave the animal somewhat undersized. The ideal method of rearing the calf is to allow it to suckle its dam, but this is not possible on the dairy farm, therefore the calf must be hand reared, and it is emphasized that calves which get the best start usually develop into the best beasts.

Having had its first feed from its mother, the calf should be removed to a clean, dry shed or shelter where it need not be fed for 24 hours, since hunger assists in teaching the calf to drink. For the first four or five days the calf should be given its mother's milk, known as colostrum or "beastings." This differs from ordinary milk in that it contains a greater quantity of more easily digested protein (about 17 per cent.), more minerals and some specific antibodies or immunizing substances which protect the calf from infections of the digestive system. The colostrum also acts as a laxative which starts the whole digestive system working for the first time. By the fifth day, the cow's milk is practically normal, and the calf can then be fed any fresh milk until it is at least two weeks old when, for economic reasons, skim milk or a suitable gruel can be gradually substituted for fresh whole milk. After the fifth week it should not be necessary to feed any new milk.

Feeding the Calf.

In practice it is found that calves do better when fed clean whole warm milk testing about 3.5 per cent. of butter-fat, and, where richer milk is produced, it can be diluted with boiling water. When reared on the cow, a calf feeds several times during the day, and, for this reason, feeding a young calf three or four times a day is frequently recommended. But, in practice, it is found that normal calves do very well under hand rearing when bucket-fed twice a day only.

When an attempt is made to rear very small or weak calves more frequent feeding should be arranged. The twice a day feeding fits in very well with the routine work on the dairy farm, as fresh milk and hot water are available immediately after milking, and the buckets used for calf feeding can be washed and sterilized with the other dairy utensils. At each feed where twice a day feeding is adopted, each calf should be given 1 lb. of new milk (3.5 per cent. butter-fat) for every 10 lb. of its live weight. Thus, a 60-lb. calf should receive 6 lb. of milk twice daily. All milk or substitutes for milk should be warmed and fed at a temperature of 95 to 100°F. The calves should be regularly fed at approximately the same time every morning and evening.

Feeding Three Times a Day.

Undoubtedly, when properly carried out, all young calves do better when fed three times daily during the first week or ten days of their life, and all very weak or small calves should be so fed. In this way they can be given slightly more food, which makes them fatter and more sleek. However, this necessitates a midday feed for which cooled milk must be kept from the morning milking in a place where it will not deteriorate, warmed before feeding, and the feeding utensils washed afterwards.

When feeding three times daily, the feeding must be spaced fairly regularly, and 6 a.m., 12 noon, and 6 p.m. would make suitable feeding times, whereas the intervals would be too irregular by feeding at 9 a.m., 1 p.m., and 5 p.m. On the dairy farm the staff is on duty in the morning and evening, and the feeding of the calves for these feeds is easily arranged, but special arrangements may be necessary for the midday meal. It is unwise to miss this feed even occasionally.

Calves do well on pasture.

The Diluted Milk.

The chief reason for recommending diluted milk is that it is more easily digested, while another reason is that dilution is a form of standardization of the milk so that when recommending a certain amount of milk, the calf receives approximately the correct quantity of nutrients. For example, 12 lb. of milk containing 5.5 per cent. of butter-fat, must not be compared with 12 lb. of 3.5 per cent. milk. The milks richer in butter-fat are also richer in proteins and milk sugar.

After entering the stomach of the calf, the milk is coagulated, forming, in the case of rich milks, a hard indigestible ball of curd which is not penetrated by the digestive juices. The digestive juices simply work on the outside of this hard mass of curd, and cannot digest it before the next feed. Undigested milk from the next feed tends to pass straight through the stomach into the intestines, and putrefaction sets up within the undigested mass of curd, upsetting the whole digestive system of the calf as evidenced by loss of appetite, scouring, and general distress.

When the milk is diluted with water to contain between 3.0 and 3.5 per cent. of butter-fat, the protein coagulates into what is referred to as a soft curd within the stomach. This soft curd allows the circulation of water containing the digestive juices through its mass and rapid digestion takes place.

To dilute milks of varying butter-fat percentage to the correct dilution for calf feeding, add water as follows:—

To 10 lb. of 3.0 per cent. milk add no water.
To 10 lb. of 3.5 per cent. milk add no water.
To 10 lb. of 4.0 per cent. milk add 1½ lb. of water.
To 10 lb. of 4.5 per cent. milk add 3 lb. of water.
To 10 lb. of 5.0 per cent. milk add 4½ lb. of water.
To 10 lb. of 5.5 per cent. milk add 6 lb. of water.
To 10 lb. of 6.0 per cent. milk add 7½ lb. of water.

It is a good plan to add boiling water as it warms the milk, but the temperature must be checked before feeding. Calves drink warm milk more readily than cold, but it should not be offered to them above 100°F. (blood heat). Cold milk is also more difficult to digest.

Teaching the Calf to Drink.

Twenty-four hours after the calf has been removed from its mother, it should be offered its first hand-fed meal. By this time the calf will be sufficiently hungry to want a feed.

For the first few days the calf should be given the milk or colostrum directly after it is drawn from the cow.

A good method of teaching the calf to drink is to back it gently into a corner, stand astride its neck and place two clean fingers, first moistened with milk, in the calf's mouth. Usually the calf will immediately commence sucking the fingers, when the calf's mouth should be lowered into the milk. As soon as the calf tastes the warm milk coming up between the fingers it offers less resistance to having its head forced downwards and sucks more willingly. After a feed or two the calf will hold its head down and suck vigorously, when the fingers can be removed, and, with repetition and patience, the calf will soon learn to drink on its own account. After a 24-hours' fast, the calf may be very hungry, but it should not be given more milk than the prescribed ration. *Patience, cleanliness,* and *warm fresh milk* are the three most important factors to consider when teaching the calf to drink.

When teaching the calf to drink, care must be taken to prevent the nostrils being immersed in the milk, since inhalation of milk will interfere with the health of the calf. Only the mouth should be lowered into the milk.

It is natural for a calf to hold its head up and suck milk downwards from the udder, while butting of the mother is also a normal trait, so that the little calf which has had only one day's experience in the world requires gentle and patient handling when it is forced to do things against its instinct. The successful rearing of calves depends largely upon the attitude and manner of the person handling them. When a good man is feeding and attending the calves, there are seldom any troubles with them and they usually look well.

Sizes of Calves.

There is a large variation in the sizes of calves at birth, and bull calves are usually about 6 lb. heavier than females. Calves of different breeds vary in birth weight, while, within the breed, the largest calves are frequently twice as heavy as the smallest, so that feeding according to size is necessary for best results. The young calf usually has had sufficient food when the hollows in the flanks are comfortably filled.

Birth weights of calves recorded at the State Research Farm, Werribee, over the last twelve years (1928 to 1939 inclusive), have averaged 78 lb. for Red Poll bull calves, 72 lb. for Red Poll heifer calves, 92 lb. for Friesian bull calves, and 86 lb. for Friesian heifer calves. No reliable Victorian figures have been obtained for calves of other breeds, but they are approximately as follows:—Milking Shorthorn, 75 to 85 lb.; Ayrshire, 60 to 70 lb.; Guernsey, 55 to 65 lb.; and Jersey, 55 to 65 lb.

Calves with varying birth weights should receive the following daily quantities of diluted milk:—

Birth Weight of Calf. lb.	Daily Quantity of Milk. lb.
40	8
50	10
60	12
70	14
80	16
90	18
100	20

The appetites of calves may also vary with the individuality of the calf, and this can be determined only by the man in charge, who should increase or decrease the ration accordingly. Practical difficulties which are experienced when rearing calves under 50 lb. weight are frequently corrected by feeding them three or four times a day. As the smaller calves grow their rations should be increased to the quantity recommended for average sized calves, viz., 12 lb. of milk daily.

Substitutes for Milk.

No matter what substitutes are to be fed later, a calf should receive new milk (3.5 per cent. test) twice daily at the rate of 1 lb. per 10 lb. body weight for at least two weeks. After this, skim milk or a suitable gruel can be gradually substituted for the new milk, as shown in the following table:—

Requirements of Milk and Milk Substitutes for Calves of Average Size—60 lb. Birth Weight:—

	Milk (3.5% butter-fat) lb. per day	Substitute lb. per day.
1st week	up to 12	—
2nd week	12	—
3rd week	9	5½
4th week	6	11
5th week	3	16½
6th to 24th week	—	22

The above quantities should be fed in two feeds—half in the morning and half in the evening to each calf.

The most common substitute for new milk is warm, fresh skim milk. Other satisfactory substitutes can be made in the form of gruels by mixing various finely ground concentrates with boiling water at the rate of 1 lb. of the dry concentrate with 10 lb. of boiling water. These gruels are best fed in conjunction with some new milk, skim milk, or fresh cheese whey, especially if there is no green feed available, but calves will do well on these gruels without milk when there is ample green, succulent pasturage. On farms where whole milk is sold, and there is no skim milk, substitutes are necessary. On many farms where separating is done, skim milk may be required for pigs, leaving insufficient skim milk for the calves without some substitute.

A clean bucket should be provided for each calf.

Gruels can be made from the following concentrates by mixing 1 lb. with 1 gallon or 10 lb. of water in each case:—(i) pollard; (ii) equal parts of pollard and skim milk powder; (iii) equal parts of pollard and linseed meal to which a cupful of limewater is added for each calf; and (iv) three parts of pollard, three parts of dried whey, and two parts of a good quality meat meal.

A gruel, made entirely from pollard is recommended only where some fresh skim milk or cheese whey is also available. When there is no green pasturage, the substitutes should be fed in conjunction with 10 per cent. of new or freshly skimmed milk. Substitute gruels should be made fresh before each feeding, and the amount to be mixed will depend upon the number of calves and the amount of milk which is available.

Water.

Because a calf is given food in liquid form a supply of drinking water is often thought to be unnecessary. This, however, is not the case, and fresh drinking water should be made available to all calves at all times.

Cleanliness.

The successful hand rearing of calves is associated with strict cleanliness. The feeding buckets and bulk food containers should be washed and sterilized with boiling water or steam after each feeding with the same care as other utensils.

When it is desired to feed milk from cows with infected udders, the milk should be boiled before being offered to the calves. If it is desired to use surplus colostrum for general feeding, it should always be boiled before use. When the calves are being "fingered," the hands should be thoroughly washed before feeding.

The sheds in which the calves are housed should be cleaned out daily, and disinfected by spraying at regular intervals with a solution of 5 per cent. lysol, or a similar disinfectant. Dusting the premises with lime also assists in keeping them sweet. The houses should be kept dry and open to as much sunshine as possible.

By utilizing three or more calf paddocks, and adopting a system of rotational grazing, infections, resulting from the fouling of the pasture, can be greatly avoided.

Other Feeds.

A calf begins to eat solid feed when about one week old, and for this reason ample pasturage and good quality hay or chaff should be provided. As the calf grows and increases in live weight, so it requires more feed, but for economic purposes the bucket ration is seldom increased. The calf should be supplied its extra food in the form of pasture and good quality meadow hay or chaff. Provided milk or a substitute is fed, as previously stated, further concentrate supplements are unnecessary. Calves should be allowed as much pasture and hay as they can eat.

These calves have access to silage and chaff after their bucket ration.

Shelter for Calves.

Portable shelters or sheds, similar to those used for pigs, provide the best protection for calves against wind and weather. These should be left open, and moved regularly about the calf paddock. For convenience, the calf paddock should be near the cow shed with a series of feeding bails at the nearest point. It is not necessary for the feeding bails to be covered, but they should have an impervious floor. The calves should be left bailed up after feeding until they lose the taste of the milk and their desire to suck one another.

Permanent buildings, such as calf pens should face the north to admit as much sunshine as possible in the winter months. In the summer time, the sun is much higher in the sky and will not reach the backs of the pens where shade will be available.

Common Ailments of Calves.

Although there are several infectious diseases affecting calves, the commonest ailments are caused through improper management, and are principally digestive disorders. They usually occur in calves under two weeks old.

The most frequent digestive disorders, followed by scouring, are the result of too much food, too little food, or food that is dirty. Before treatment, the cause must be determined.

Bail feeding at the Salesian College, Sunbury.

Every farmer should aim at rearing heifers as good as these.

If the trouble is too much food, give them boiled water at the next feed instead of milk, then boil the milk, and give the correct quantity of boiled milk at subsequent feedings until scouring ceases. The feeding of very rich milk may be the cause of the overfeeding, and in that case the same treatment should be followed, but the milk should also be diluted to 3.5 per cent. butter-fat and boiled before feeding.

Much scouring occurs amongst calves that are poor drinkers and do not receive sufficient food. These calves should be treated patiently and fed three or four times a day on boiled milk diluted to contain 3.5 per cent. of butter-fat, giving them 12 lb. of milk per day until scouring ceases and they drink properly.

Where scouring is caused by dirty milk or dirty feeding buckets, cleanliness must be attended to, and the calves treated as though they were being overfed.

When calves are housed overnight and let out immediately after feeding in the morning, they gallop round the paddock on a full stomach, and upset their digestive system. This can be prevented by an adjustment in the system of management, and it demonstrates the advisability of having the calves in a shed continually opened to the pasture. If the calf paddock is subdivided to permit a system of rotational grazing, it is much easier to control ailments in older calves.

Ear Marking, Tattooing, and Castration.

Ear marking, tattooing and castration are best done when the calves are two weeks old. A mild, calm day should be selected, and strict cleanliness should be observed during the operations.

Dehorning.

There are two different ways of removing horns; first to stop the growth of horn in the young calf, and the second, to remove the horns from the full-grown beast. The first method, which prevents the horn from developing, is carried out on very young calves by means of the application of some caustic substance to the immature horn bud. The procedure is very simple, and is carried out in the following manner:—

The calf should be treated when between the age of two and seven days, the hair being clipped off around the horn bud and a coating of vaseline applied to the surrounding skin to prevent injury from the caustic. Caustic potash, which is the preparation generally used, may be obtained in the form of rods or pencils from any chemist, and should be wrapped round with tough paper to protect the operator's fingers. The horn bud should be lightly rubbed with a piece of fine sand-paper till the surface becomes moist, but not bleeding. Then rub the horn with the caustic,

taking care that the whole surface has been treated. This should be repeated two or three times at intervals of a few minutes till blood appears in the centre of the horn. If done thoroughly the growth of horn will be prevented, and the animal will suffer hardly any inconvenience.

After applying the caustic take care that the calf is not exposed to rain for a day or two, as the caustic may run down the face and injure the skin. After using the caustic stick wipe any moisture off it, and keep it in a well-corked, wide-mouthed bottle. Otherwise it will absorb moisture from the air and melt away. In cases of burning of the skin by caustic potash, immediately apply a weak solution of vinegar and water to the injured part.

After Weaning.

Normally, calves can be weaned from the bucket between five and six months old, when they should be turned out on to good pasture. Good-quality meadow or lucerne hay is the best food supplement for growing stock. Concentrates are not necessary supplements when ample roughage and pasturage are available. In fact, concentrates, as well as being more costly, tend to fatten rather than grow the animals. Every possible effort should be made to grow all heifers as large as possible, because it has been proved time and time again that, other things being equal, the largest animals are the best producers. Further, under Australian conditions, it is desirable that heifers be mated before they are fifteen months old to calve at two years old. They must, therefore, be kept growing and adequately fed while pregnant.

Steer Calves.

Where a large breed of dairy cattle or a dual-purpose breed is maintained for dairying, steer calves are often reared. It is not economical to fatten these calves into prime vealers (ten to twelve months old) on the bucket, but by rearing them as already described they can later be readily fattened into prime baby beef at two to two and a half years of age.

Planting of Early Potatoes

The Minister of Agriculture, the Honorable E. J. Hogan, has pointed out that, owing to reduced acreage, the dry summer, and frosts in February and March, the potato crop this year in Victoria is estimated to yield less than 70,000 tons, while the normal consumption in Victoria alone is 100,000 tons each year.

The area under potatoes in Victoria has dropped from 69,783 acres in 1932-33 to an estimated 32,500 acres this year. It is estimated that the total crop of Australia, including Tasmania, will be only 270,000 tons, and the normal consumption in Australia is 340,000 tons.

Although arrangements have been made to allow New Zealand to export 5,000 tons of potatoes to Sydney, there will be insufficient potatoes for human consumption in Australia and in Victoria next November, December, and January. It should be a good proposition, therefore, for potato growers in early districts, such as Koroit, Colac, and Koo-wee-rup, to plant early seed varieties during August and September, so that early potatoes will be available to market in December and January.

Cod Liver Oil

Imports of cod liver oil have ceased, merchants' stocks are exhausted and, as there is little likelihood of new supplies for poultry and other animals being available for some considerable time, farmers are advised to feed more fresh succulent greenstuff and expose their animals to more direct sunshine.

Greenstuff is one of the best known sources of vitamin A, in fact the cod fish obtains all the vitamin A which is concentrated in its liver oil from green seaweed. The other vitamin contained in cod liver oil is vitamin D, which is formed by the action of the direct rays of the sun on the skin of all animals, including birds and fishes.

The natural sources of both of these health promoting vitamins are greenstuff and sunlight, therefore, for growing large healthy animals, farmers should grow a regular supply of greenstuff for feeding purposes, and house their stock in well-lighted sheds which will admit some direct sunlight.

Worms in Sheep

By S. A. Mountjoy, L.V.Sc., Veterinary Officer

OF all the domestic animals, sheep are the most subject to serious infestations with animal parasites such as worms, and it not infrequently happens that heavy mortality directly attributable to internal parasites may occur in flocks. Even when there is no mortality, the presence of worms may mean great economic loss to the sheep-raiser, for infested sheep usually are reduced in condition, and their fleeces are appreciably lighter than those of healthy sheep.

Healthy, well nourished, adult animals exhibit a marked natural resistance to worm infestation. During early life this resistance is not developed to a great extent, so that the more serious effects of worms are frequently seen amongst lambs and young sheep (weaners). When exposed to infestation, animals which are experiencing a drain on their vitality such as pregnant or nursing ewes, and ill-nourished sheep show a lowered resistance to the harmful effects of internal parasites.

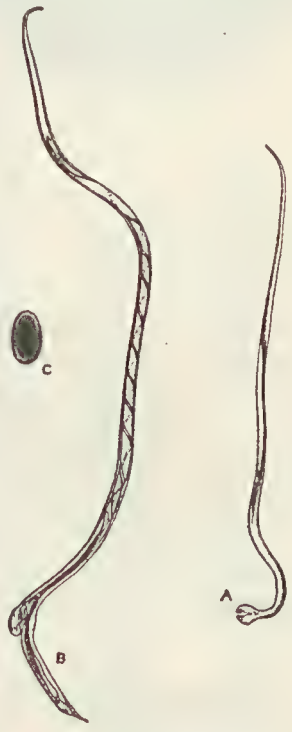
The onset and also the duration of symptoms are largely determined by dietetic conditions. Worms usually occur amongst sheep which have access to swampy lands or heavy pastures which remain damp for long periods, although these conditions are not essential. Old pastures, especially those that have been overstocked, are particularly dangerous on account of the gross contamination due to the accumulation of young immature worms.

STOMACH WORMS.

Stomach worms are found in the fourth stomach, and there are three forms of importance in Victoria—(1) *Haemonchus contortus,* (2) *Ostertagia circumcincta,* and (3) *Trichostrongyles axei.*

Haemonchus contortus.—The large stomach worm, barber's pole or wire worm, is a blood sucking round worm measuring from ¾ inch to 1¼ inches in length. The male is bright red and the female striped red and white. If the fourth stomach of an affected sheep be opened immediately after death, these worms will be seen wriggling actively in the stomach contents. On exposure to the air, however, their motility soon ceases.

As a rule this worm is not of great importance in Victoria, but severe losses from *Haemonchosis* do occur at times.



Stomach Worm.
(Haemonchus contortus.)
A.—Male. B.—Female. C.—Egg

Life History.—The mature female lays a large number of eggs, which are passed out in the dung. Freezing or desiccation will kill the eggs, but, if the temperature be favorable, they soon hatch out. The immature worms when hatched increase in size, undergo two changes in structure, and eventually crawl on to a blade of grass, where they remain dormant until eaten by a sheep, in the stomach of which they attain maturity in three weeks.

The resistance of the young worms, before being eaten by sheep, is very great. They can

***The lesser stomach worm** (natural size).*
(Ostertagia circumcinta)
[Q'land Dept. Agric.

stand the cold of winter without suffering any harm, and if conditions are favorable may remain alive on pastures for about ten months.

Ostertagia circumcincta. — The medium stomach or brown hair worm. This species is brown in colour and about ½ inch in length.

Life History.—Until eaten by a sheep, the life history of these worms is similar to that of *Haemonchus contortus.* After ingestion, however, part of their development takes place in the wall of the fourth stomach where they form small nodular areas. After leaving the nodules, development is completed in the mucous membranes, the female reaching maturity in fifteen days.

Trichostrongyles axei.—This is a very fine pale pink worm from ¼ to ⅓ of an inch in length.

INTESTINAL WORMS.

Intestinal worms consist of two types—round worms and tapeworms.

Round Worms.—By far the most serious effects from worms are caused by several species of the genus *Trichostrongylus* and related forms, and the disease they cause is known as trychostrongylosis or black scours. They are commonly called the "small intestinal worms." These small worms are ¼ to ⅓ of an inch long, pale pink in colour, and difficult to see. One species (previously mentioned) is found in the fourth stomach, but the other species should be looked for in the first ten feet of the small intestine. To detect these small worms scrape the inner surface of the fourth stomach or small intestine with a knife, place the scrapings thinly between two pieces of clear glass, and hold up to the light, when they may be seen as small hair-like structures.

Nematodirus species are found in the small intestines, being most numerous (when present) from the sixth to the twentieth foot. They may be up to 1 inch in length, and are creamy to bright pink in colour.

In the large intestines occur two species of *Oesophagostamum. Oesophagostamum columbianum,* a white, fairly thick worm, from ½ inch to 1 inch in length, causes a nodular disease of the intestine, known to butchers as "Pimply Gut." The young or larval worms on reaching the intestine bore into the wall and cause small shot-like nodules. They eventually leave the nodules to become mature in the lumen of the bowel. They are most commonly found in the large bowel, but may be found throughout the intestinal tract.

Another species, *Oesophagostamum venulosum,* is not associated with the formation of intestinal nodules during its development, but it is now considered that the adult forms of this parasite are extremely harmful. The former species has never become established in Victoria.

Other round worms found in the large bowel of sheep are *Chabertia ovina* and *Trichuris ovis.* Both of these are quite easily seen. *Chabertia ovina* is a stout white worm, which is usually found adhering to the bowel lining. *Trichuris ovis,* the whip-worm, so called because of its resemblance to a stock-whip, is

***Hair worms** (natural size).*
(Trichostrongyles spp.)
[Q'land Dept. Agric.

white in colour, and when stretched measures up to 3 inches in length. It is found in the caecum and large intestines. These two varieties are rarely associated with disease in sheep.

Tapeworms.—There are two tapeworms of importance found in the small intestines of sheep in Australia, viz., *Monieza benedini* and *Monieza expansa*. These are long, yellowish-white, ribbon-shaped, segmented worms, measuring up to 18 feet in length.

When ripe, the end segments, which are filled with eggs, drop off, and are passed out with the droppings, and serve as an indication of the presence of the infection.

Probably on account of their size, these worms are usually blamed by sheep owners for serious trouble in sheep, but investigation invariably shows that it is caused by the much more important parasites, viz., stomach and small intestinal worms (trichostrongyles).

Symptoms of Infestations.

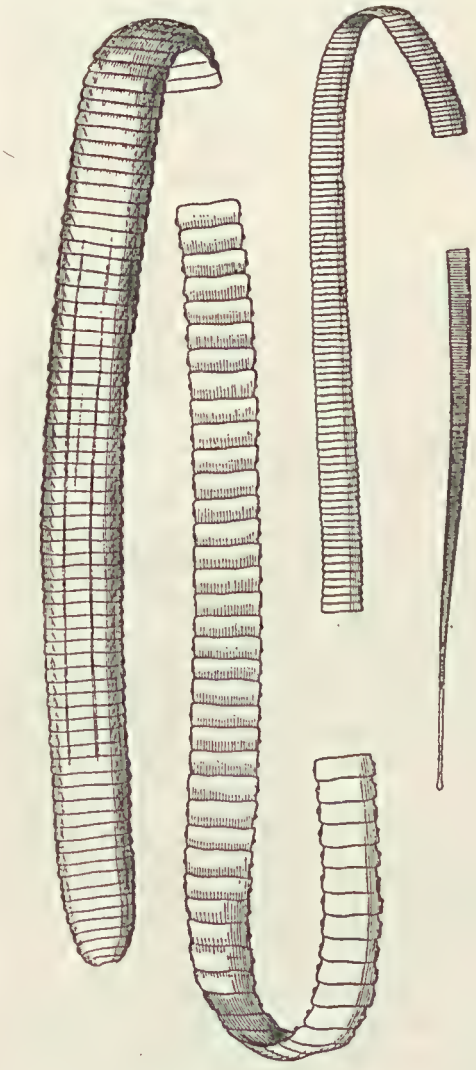
In some cases no serious symptoms are noticed for some time. Usually the first symptoms seen are that the animals appear less lively, lose condition, and remain stunted in development. If examined, the membranes of the eyes and mouth will be seen to be paler than normal. Later on, diarrhoea sets in, and swellings may appear below the jaws. The animals become extremely emaciated, and the mortality may be heavy.

For correct diagnosis it is suggested that all the internal organs from an affected sheep be forwarded by rail to Spencer-street and addressed to the Veterinary Research Institute, Story-street, Parkville. Cut ends should be tied securely, and the organs placed in a kerosene or petrol tin and covered with formalin solution (one cupful to 2 gallons of water). The tin should be soldered down. The Director of the Institute should be notified of the despatch of the specimens.

Treatment.

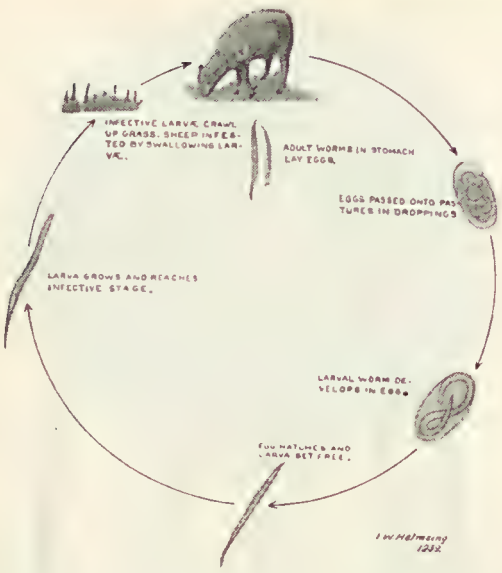
A combination of copper sulphate and nicotine sulphate (40 per cent.) in water is highly effective against the large stomach worm (*Haemonchus contortus*), and is practically a specific for tapeworms. Good results also are obtained against the medium stomach worm (Ostertagia) and Nematodirus with this combination.

Treatment for trichostrongylosis is not so satisfactory, but work conducted by the Council for Scientific and Industrial Research has shown that by far the best results are obtained when sheep are regularly treated with the copper sulphate and nicotine sulphate combination. Treatment should be carried out not only to cure affected sheep, but also to reduce the amount of infestation from year to year.



Tapeworms (natural size).
(Monieza expansa.)
[Reproduced from *A Treatise on the Parasites and Parasitic Diseases of the Domesticated Animals*, by L. G. Neumann.]

As mentioned in the life histories of the various worms, infestation takes place through sheep eating grass on which the immature


INFECTIVE LARVÆ CRAWL UP GRASS. SHEEP INFESTED BY SWALLOWING LARVÆ.
ADULT WORMS IN STOMACH LAY EGGS.
EGGS PASSED ONTO PASTURES IN DROPPINGS
LARVA GROWS AND REACHES INFECTIVE STAGE.
LARVAL WORM DEVELOPS IN EGG.
EGG HATCHES AND LARVA SET FREE.

Showing how sheep become infested with round worms.

[Q'land Dept. Agric.

forms of the worms are encysted. Sheep, when returned to pasture after dosing, may thus be reinfested, especially during the spring and summer months.

Lambs, weaners, and lambing ewes are more liable to suffer harmful effects from an infestation, and efforts should be made to prevent this by carrying out treatment with copper sulphate and nicotine sulphate every three or four weeks through the spring, summer, and autumn months. Dosing should be commenced as soon as the grass begins to grow. By this method numbers of young worms are destroyed before they can lay eggs to reinfest the pasture. Starvation prior to drenching is not necessary.

Preparing the Solution.

Use porcelain or enamelware utensils in preparing and administering the solution, as the copper sulphate will corrode ordinary metal utensils.

Make up a stock solution as follows:—

Dissolve 2 oz. of copper sulphate (bluestone) in ½ pint of boiling water, then add enough cold water to make a total of 1 gallon (160 oz.). To this add 2 oz. of nicotine sulphate 40 per cent. (Black leaf 40). In dissolving the copper sulphate, all white or powdery lumps should be discarded, and only hard blue lumps used.

The doses suggested are—

For adult sheep—2 oz. (4 tablespoonfuls).
Sheep 6 to 12 months old—1½ oz. + ½ oz. water.
Lambs 3 to 6 months old—1 oz.
Lambs under 3 months—½ oz. + ½ oz. water.

For smaller doses than 2 oz. alter the above stock solution as follows:—Dissolve 4 oz. of copper sulphate in 1 gallon of water and add 4 oz. of nicotine sulphate. The doses of this mixture then are:—

For adult sheep—1 oz. or 30 c.c.
For sheep 6 to 12 months old—¾ oz. + ¼ oz. of water.
For lambs 3 to 6 months old—½ oz. + ½ oz. of water.
For lambs under 3 months—¼ oz. + ¾ oz. of water.

Special brass or copper drenching horns which hold the exact dose, may be procured for administering the drench. Drenching guns of suitable material are also available. When drenching, care should be taken so that the membranes of the mouth are not injured. The sheep should be drenched standing on all four feet, and the nose held about level with the eyes. Hold the head in position with the left hand, with the four fingers under the jaw and the thumb over the nose. The jaws should not be gripped tightly.

Place the drenching horn through the side of the animal's mouth, over the tongue, and between the back teeth, and pour the dose in slowly. The head should be lowered immediately if the sheep begins to cough. After treatment the animals should be put on to fresh pasture. Hand feeding with grain such as oats (crushed for preference) is very beneficial. This is particularly necessary for the "tail" of the flock which should be drafted off and fed separately.

LUNG AND BRONCHIAL WORMS.

Lung worm disease is fairly common in this State. The disease may appear in a flock at any time, but usually it occurs from early spring to late autumn. It is common in low-lying, marshy districts of high rainfall and in areas subject to flooding. Mortalities may occur from heavy infestations with lung worms, but in most cases where these parasites are blamed the actual causes of death

are the previously mentioned stomach and small intestinal worms. Some varieties of these are invariably present.

The more important in Victoria are—The *Bronchial Worm* (*Dictyocaulus filaria*) and the *Small Lung Worm* (*Muellerius capillaris*). The latter is a fine, hair-like, brownish-red worm about ¾ inch to 1¼ inches in length. It is found in the finest air passages and its presence is indicated by raised greyish nodular areas in the lungs.

Dictyocaulus filaria, the large lung worm or bronchial worm, is a white, hair-like worm, from 1½ inches to 4½ inches in length, and is found packed in the smaller bronchioles at the base of the lung. It may also be present in the larger air passages.

Life History.—The life history of this worm is as follows:—

The female lays eggs, each containing an embryo, in the air passage. These are coughed up and normally are swallowed. Hatching in the bowels, they are passed out with the droppings. On the ground they undergo changes in structure, and then crawl on to the grass, where they remain more or less resistant. They are eaten by the sheep, particularly when grazing over shallow, marshy areas, or may be swallowed in the drinking water. After being swallowed they bore into the bowel wall and into the lymph stream and pass to the heart. From the heart they are carried in the blood to the lungs passing through the walls of the alveoli into the air passages where they reach the adult stage.

The life history of the lung worm (*Muellerius capillaris*) differs from that of *Dictyocaulus filaria* in that the larval stage is passed in the bodies of certain snails.

The Bronchial Worm.
(*Dictyocaulus filaria.*)
A.—Male. B.—Female.
(Natural size.)

The Lung Worm.
(*Muellerius capillaris.*)
Male and Female.

[Reproduced from *A Treatise on the Parasites and Parasitic Diseases of Domesticated Animals*, by L. G. Neumann.]

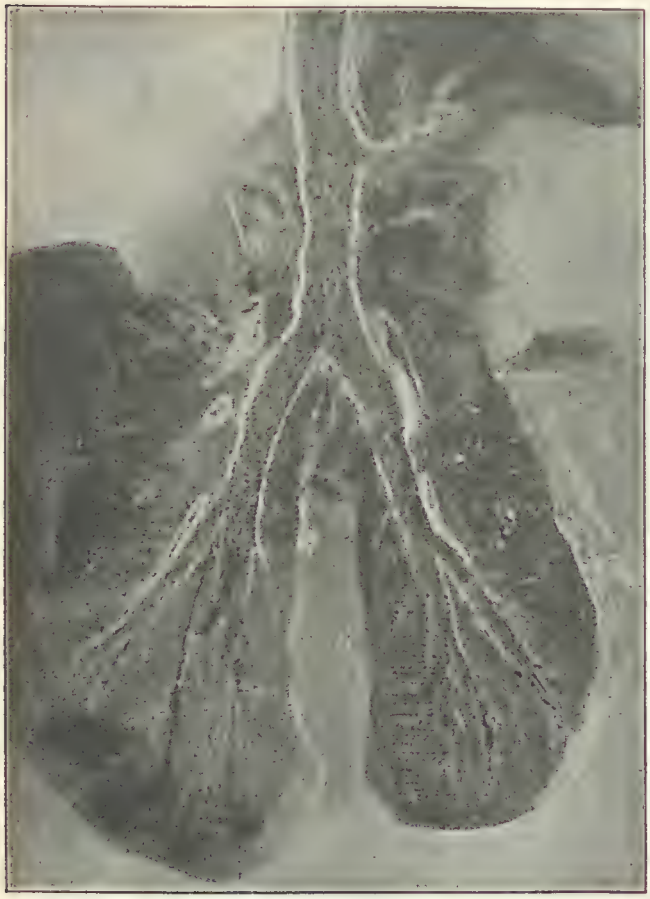
Symptoms.

The disease develops as an insidious bronchitis which may develop into pneumonia. The first thing noticed is a cough, which at the start occurs only in a few animals; it is short, dry, and strong. Gradually most of the flock will be noticed to be affected with this cough. As the disease progresses the cough becomes more frequent, but weaker. The bronchial secretions are expelled through the mouth in lumps. There is also a mucus discharge from the nostrils. Breathing becomes more and more difficult. The sheep become emaciated and the membranes of the eyes, nostrils, and mouth become pale. After a period of from about two to four months deaths may occur from exhaustion. The diarrhoea which is often present is due to stomach and small intestinal worms.

Treatment.

Treatment of lung worm disease is rather unsatisfactory, and in most cases good food and care probably will give better results than medicinal treatment. As stomach and intestinal worms are invariably present, drenching with copper sulphate and nicotine sulphate (as previously described) should be carried out to destroy these parasites, thus enabling the sheep to withstand better the effects of the lung worm invasion.

Remove the animals from the source of infestation and, if possible, put them on better pasture. If this cannot be done hand feeding should be resorted to, to build up the condition of the sheep. In the case of valuable stud sheep, intratracheal injections may be tried, but as this treatment requires skill it should be carried out only under the supervision of a qualified veterinarian.



Sheep's Lung showing exceptionally heavy infestation with Thread Worms.

Part of the lung and the mucus surrounding the worms have been removed so that they may be seen in position in all tubes of the lung.

[Reproduced from the *Journal of the Ministry of Agriculture* (Eng.).]

Prevention of Worm Infestation.

1. Adequate nutrition is particularly important. Sheep in good, strong, healthy condition can withstand the effects of a worm infestation, even though they may be harbouring hundreds of worms, whereas those in low weak condition are unable to withstand these ill-effects, and mortality amongst the latter may be heavy.

Lambs and weaners (until they are at least twelve months old) should not be allowed to suffer any check in their growth. To prevent any such check hand feeding should commence before the pastures decline in food value. Crushed oats, ¼ to ½ lb. per head per day, is a very good concentrate, though other grains, such as wheat, barley, or maize, and/or meadow hay and lucerne hay may be used.

2. After medicinal treatment, sheep should be moved to fresh pasture and, if possible, the paddock just vacated should be left free of sheep for twelve months, during which time it may be cultivated with advantage. Where this is not possible, frequent changes of pasture will be of assistance.

3. Over-stocking and close grazing should be avoided. The more worm-infested sheep graze over a particular pasture, the greater will be the amount of contamination with eggs and young worms. Sheep grazing close to the ground pick up a larger number of immature worms than those on longer pasture.

4. All dams and watering places should be fenced off, and troughing supplied for stock to drink from. Troughs should be cleaned regularly.

5. Low-lying swampy pastures should be drained.

6. A burning off of worm infested pasture is one of the best means of destroying the young worms, and should be carried out where practicable. Care should be taken, however, not to prevent seeding of pastures.

Reference.

Clunies Ross and Gordon.—The Internal Parasites of Sheep.

Codling Moth and Black Spot

Fourth Annual Report of the Apple and Pear Demonstration Plots

FOR the past four seasons, demonstration plots have been established throughout the State in an effort to extend advisory work in the control of black spot and codling moth, the two major troubles in apple and pear orchards. This work has been made possible by a grant from the Commonwealth Government. In the following report, a brief *résumé* of the first three years' operations is followed by an outline of the plot work for the 1939-40 season.

In the season 1936-37, plots were conducted on 25 properties. During that year the practice of timing codling moth sprays was demonstrated to growers by means of lure pots installed in each plot. The plots were then sprayed according to the extent of the moth catch in the pots. The methods of distributing spray advice were mainly by the use of lure charts and wireless forecasts. A report of the results obtained in the first year was given in the August and September, 1937, issues of this *Journal*.

During the following season (1937-38) plots were conducted on 23 properties on similar lines to the previous season. Trials with various lure materials were included, and variations were shown in their properties as attractants. A sweet wine of the port wine type was found to trap more moths than materials previously used such as vinegar, molasses, apple juice, cider, &c. The report of the year's work appeared in *Victorian Journal of Agriculture*, August, 1938.

For the season 1938-39, 24 plots were established on various orchard properties. More extensive use of wine as a lure material was made during this season. The policy in issuing spray advice was to rely on the information gained from the lures under the care of the district orchard supervisor. Growers were also encouraged to use lures in their own orchards. The scope and intensity of the advisory services were increased, and there was an expansion in the number of growers contacted by the circular system.

During this season there was an increased use of white oil emulsion, particularly in combination sprays, for the control of codling moth. A report of this work appeared in the September, 1939, issue of this *Journal*.

The demonstration plots are also used for trials in the maintenance of soil fertility. The results of the tests in the growing of crops for green manure appeared in the March, 1940, issue of this *Journal*. Peas and barley sown in combination, at the rates of ¾ bushel and ½ bushel per acre respectively, provided satisfactory growth on southern district plots where soil conditions were favorable. Application of both sulphate of ammonia (2 cwt. per acre) and lime (2 tons per acre) produced a greater bulk of greenstuff than the crops sown only with the normal dressing of superphosphate (2 cwt. per acre). Where soil fertility was low, it was advantageous to increase the rate of seeding.

Tick beans, sown at the rate of 1½ bushels per acre, gave satisfactory results on plots in northern pear-growing areas. Weed growth was best stimulated by top-dressing with sulphate of ammonia except in the Goulburn Valley, where applications of superphosphate caused an increased growth of trefoil.

In the fertilizer experiments yields from trees which received applications of sulphate of ammonia (4 lb. per tree) and complete fertilizer (5 lb. per tree) are compared with yields from trees receiving no manurial treatment.

In all, there are eighteen such trials distributed throughout the principal apple and pear-growing districts. In several instances differences in yield have been obtained which were significant; but, until such differences are consistent, no recommendations can be made.

The advisory section of the plot work is regarded as most important, and the plots are used primarily as a means to obtain information on which the supervisor can base his advice for the rest of the district. The plots themselves are sprayed according to this advice, and thus they serve as a guide and an object lesson to surrounding growers. The dissemination of spray advice is brought about by a number of methods, such as circulars, press notices, charts, wireless forecasts, &c. These will be discussed in a later section of this report.

Layout of Plots.

Last season there was a total of 62 properties on which plots were conducted. Of these, 54 plots were used as locations for lures, and were sprayed for the control of black spot and codling moth according to Departmental recommendations.

Recharging a lure pot on a demonstration plot.

On eight properties, small trials were conducted in which double rows of trees received different spray treatments. The schedules used in these trials were modifications of the ordinary lead arsenate programme. With such a layout, it was not expected that information, similar to that which might be obtained from a more detailed type of experiment, would result. The trials were of interest as demonstrations of the various schedules.

The schedules for codling moth sprays used on the 54 plots mentioned above varied according to the district and variety. They included the following programmes:—

A. Straight lead arsenate used at the rate of 6 lb. of paste (or 3 lb. of powder) per 100 gallons of water.

B. Lead arsenate for the calyx and first one or two cover-sprays, followed by white oil emulsion, strength 1:80.

C. Lead arsenate for the calyx sprays followed by combination sprays of lead arsenate and white oil emulsion until the end of November. White oil emulsion 1 : 80 was used for later sprays.

D. For canning pears only—same as "C," but combination sprays were used throughout the season.

Ten lure pots were situated on each plot. The material used consisted of an inferior grade of sweet wine. This was diluted with nine parts of water, and, during warm weather, a few grains of bluestone were added to prevent yeast growth. The lures were recharged weekly and, in most instances, checked twice a week. Black spot sprays were applied according to the recommendations given at the end of this report.

Results.

Because of the increased number of plots and the fact that supervisors were engaged on other duties, it was impossible to obtain detailed harvest records from all plots. However, the results based on sampling were generally satisfactory, and indicated that the methods adopted were effective in the control of these pests.

On the northern pear plots, there was a decided improvement in control compared with that obtained last season. This may have been partly due to seasonal conditions, because it was generally agreed that the 1938-39 season in the Goulburn Valley was a most difficult one for codling moth control. Even so, the careful timing of sprays definitely reduced the moth population on these plots. A feature of the moth activity at Lancaster and Shepparton was the very low moth catch obtained in the lures after the new year. The spring brood emergence was completed by November, and this was controlled by two sprays in addition to the calyx application. Where the moth population was very low—i.e., on the properties of Messrs. W. Young (Lancaster) and W. Mulconry (Shepparton)—very little moth activity was recorded after this period. The timing of later sprays in these districts was, therefore, dependent on lures situated in properties with a higher moth population. The infection figures in Table I. reveal that control was good in these districts.

TABLE I.—CODLING MOTH INFECTION, 1939-40.

Pear Plots.

District.	Orchard.	Variety.	Schedule.	Number of Trees.	Average Yield per Tree.	Number of Infected Fruit per Tree.	Percentage Infection due to Codling Moth.
Bamawm	J. Sinclair ..	Josephine ..	C	38	1,687	12·8	0·7
		W.B.C.	D	66	728	7·0	0·9
		Beurre Bosc ..	C	57	517	5·4	1·0
		Packham's ..	C	40	649	7·1	1·1
Lancaster	W. Young ..	W.B.C.	D	234	383	Infection negligible.	
Ardmona	V. McNab ..	W.B.C.	D	188	1,054	8·8	4·7
Toolamba West ..	S. Simson ..	Packham's ..	A	72	318	10 8	3·4
			B	72	313	10 0	3·2
			C	12	338	15 9	4·7
Shepparton ..	A. W. Fairley ..	Packham's ..	A	92	..	..	4·2
			D	92	..	..	3·3
			C	92	..	..	2·2
	D. J. Corboy ..	W.B.C.	D	560	356	31·2	8·8
	A. A. Spivey ..	W.B.C.	D	264	194	6·2	3 2
	W. Mulconry ..	W.B.C.	A	321	482	1·0	0·4
East Burwood ..	V. Fankhauser ..	Packham's ..	A	240	155	4·1	2·7

Two new plots were located on the properties of Messrs. Spivey and Corboy. Both these growers during the previous season had experienced difficulty in control, and infection had been over 25 per cent. By the careful timing of sprays and the use of schedule D, reasonable control was obtained on these properties. The results of the trials conducted on the plots owned by Messrs. Fairley (Shepparton) and Simson (Toolamba West) did not reveal great differences in efficiency of the various treatments. At Mr. Fairley's, the use of "C" schedule on the Packham's variety resulted in only half the amount of infection that occurred on the "A" block; but, considering that the latter amounted to only 4.2 per cent., it could not be said that the lead schedule was unsatisfactory.

Bag bandaging was practised generally throughout the pear-growing districts in the north. A feature of this was the late entry of larvae into the bands. It was not until mid-December that grubs were retrieved from the bands in any number, whereas during the previous season they had commenced to enter the bands late in November.

TABLE II.—CODLING MOTH INFECTION, 1939-40.

Apple Plots.

District.	Orchard.	Variety.	Schedule.	Number of Trees.	Average Yield per Tree.	Number of Infected Fruit per Tree.	Percentage Infection due to Codling Moth.
Tyabb	G. G. Cole and Son	Jonathan ..	A	112	208	11·2	5·4
			B	112	377	11·0	2·9
Red Hill	R. H. Holmes ..	Jonathan ..	A	100	809	19·6	2·4
Panton Hill ..	S. Cracknell ..	Jonathan ..	A	114	367	18·0	5·1
*Croydon	D. Lipscombe ..	Jonathan ..	A	33	472	37·0	7·8
			B (1)	37	557	38·0	6·8
			B (2)	41	374	32·0	8·7
			B (3)	45	441	48·0	10·5
			C	49	471	38·0	7·8
†Wantirna	J. B. Murdoch ..	Jonathan ..	A	72	292	13·2	4·5
			B (*a*)	72	93·5	23·3	24·9
			B (*b*)	72	79	23·1	20·9
			B (*c*)	72	198	11·8	5·7
			C	72	216·5	11·2	5·4
Scoresby	A. S. Jenkins ..	Jonathan ..	B	96	150	15·0	9·7
		Rome Beauty ..	B	96	206	17·0	8·9
Wallington ..	O. Harding ..	Stewart's ..	A	45	166·5	10·5	6·1
Batesford	M. Ellwood ..	Rome Beauty ..	A	70	158	6·6	3·8
		Dunn's	A	60	131	2·0	1·7
			B	60	106	1·6	1·8
Amphitheatre ..	J. Mill	Jonathan ..	B	112	84·6	0·7	0·8
Quantong	R. Gersch ..	Cleopatra ..	C	105	219	10·1	4·6
Stanley	N. Pope	Granny Smith ..	A	56	1,185	17·8	1·6
		London Pippin ..	A	100	212	12·2	5·7
		Delicious ..	A	30	161	11·6	7·2

N.B. Infection data includes stings and entries in all fruit including windfalls.

* B (1)—White oil emulsion 1 : 60.
B (2)—White oil emulsion 1 : 60.
B (3)—White oil emulsion 1 : 80.
† B (*a*)—White oil emulsion 1 : 60.
B (*b*)—White oil emulsion 1 : 60.
B (*c*)—White oil emulsion 1 : 60, used late in season only.

Moth activity varied greatly on the apple plots. For instance, the lure pots, which were located at Portland this year for the first time, caught a maximum of eighteen moths in one week, while over 300 moths per week were trapped during peak periods on some of the plots in the warmer areas. There were also differences in the time of activity. The plots at Stanley showed that activity did not commence until mid-November in that district, while in the warmer districts such as Harcourt, Quantong, &c., large catches were obtained in late October.

Spraying apple trees with arsenate of lead for the control of codling moth. Note the power spray (capacity 220 gals.) drawn by tractor.

Judging by the lure catches, codling moth activity in southern districts was almost equal to that occurring during the previous season. Generally speaking, cool weather during the early summer was not favorable to activity and infection was apparently low following the spring brood. In late January there was a noticeable increase in activity, and this was followed by further periods of egg-laying during February and March. The brood emerging during the March heat-wave took its toll of a fair amount of fruit. Coming just at harvest time, many growers did not find time to apply a spray, and consequently a number of entries occurred. Several instances were noticed where fruits, on which eggs had been laid, were picked. The eggs had hatched before storage and young grubs had entered the fruit. Under such circumstances it would have been well worth while to have applied an oil spray just before picking. This is an important point when fruit is exported, because it would be quite possible for apples to reach the packer without damage to the eggs. They could then hatch in the interval between packing and reaching the ship and the apples arrive at the destination as codling-infected fruit.

The infection data in Table II. indicate that fairly satisfactory results were obtained on apple plots where, except in one or two cases, the percentage infection of all fruit, including windfalls, was less than 7.5 per cent. The high infection on the two blocks sprayed with schedule "B" at Wantirna can be ascribed to the light crop on these trees combined with the fact that, unfortunately, a spray was not applied at a vital period when moths had been particularly active.

At Wantirna and Croydon, trials had been set out to compare—

(*a*) Two brands of oil used in schedule "B."

(*b*) Schedules "A," "B," and "C."

The first trial was set out because, in the previous year, white oil of a particular brand had been used at a strength of 1:60 and the fruit had been discoloured. This year, however, no injury occurred with either of the brands used at this strength. The previous injury was probably due to the dry, hot conditions which occurred during that year.

In comparing the schedules on both properties, no definite information was gained because the differences in infection on these plots were not great enough.

At Harcourt, where a trial with varying strengths of oils was carried out—1:60, 1:80, 1:100—detailed harvest data were not obtained. A careful survey by the local supervisor at harvest time showed that there was no difference in infection with any of these treatments.

Spray Advisory Services.

The value of timing sprays as a means of increasing their efficiency is fully recognized by growers, many of whom have installed lure pots in their orchards for their own information. However, the district orchard supervisor, by his knowledge of moth life history, data obtained from checking lures in several centres in each district, and careful examination of fruit for the presence of eggs, is in a position to make accurate recommendations for the whole district.

[*Continued on page 406.*

Hypocalcaemia or Milk Fever in Ewes

By H. M. Elder, B.V.Sc., Veterinary Officer

DURING the autumn and winter of 1939, large numbers of ewes throughout Victoria were affected with a disease known as Hypocalcaemia, or Milk Fever. The disease is not known to have been prevalent to any great extent in Victoria before, and is unlikely to be prevalent again unless a season similar to that of 1939 is experienced. Isolated cases may occur on rich green feed in any season. It occurred in ewes heavy in lamb, and also in those with lambs at foot, even with lambs up to eight weeks old.

The onset of the disease is sudden and usually associated with some special factor, such as putting ewes on to rank green feed, especially green crop, or with droving ewes some distance, or yarding them overnight. Affected animals are first seen to be rather staggery in their walk and weak in the hind quarters. They stand about and appear restless and nervous, and have a watery discharge from the nostrils and mouth. The pupil of the eye is widely dilated, and the breathing is rapid and panting in nature. They soon go down, often with the back legs extended behind them, and sink into a coma.

Post-mortem Appearance.

Post-mortem examination shows congestion of the lungs, and the liver is congested and blotchy red, and exceptionally crumbly. Haemorrhages under the surface of the external muscle of the heart are common. The heart muscle is not flabby as in pregnancy toxaemia. The carcass is usually very fat. Bio-chemical analysis of the blood shows a marked reduction in the calcium content, this being reduced to one-half or even one-quarter of the normal amount. The sudden lowering of the calcium content of the blood apparently causes the onset of the disease as in milk fever of cows.

Treatment.

Treatment of ewes with lambs at foot is much more successful than it is with those in lamb. For ewes with lambs at foot, inflation of the udder with air often effects recovery without further treatment. A useful emergency makeshift for inflating the udder is the metal nipple of a bicycle tube attached to a bicycle pump; or a hypodermic needle with the point filed off may be attached to a rubber tubing on to a pump. Any apparatus must be sterilized before inserting into the teat.

If the ewe does not get up soon after inflation of the udder, molasses should be administered two or three times daily, one cupful of molasses mixed with an equal quantity of water being given for each dose. Molasses gives better results than refined treacle. The same treatment should be used for ewes in lamb. Obviously, the earlier the treatment is commenced, the more hope there is of recovery.

Injections of calcium gluconate or calcium boro-gluconate, although theoretically correct, do not give very satisfactory results in actual practice. Although the calcium content of the blood is restored, recovery frequently is not effected. Better results have been obtained by injecting a solution of a calcium salt into the jugular vein, but this is not practicable for the average sheep-owner.

It is possible to prevent the disease by careful attention to the diet of pregnant and lactating ewes. When there is an abnormally prolific growth of green feed, it is better to graze sheep on only a portion of the property, and keep the feed on that portion under control, than to allow them on rank feed on the whole property. Some dry feed, such as oaten chaff, or oaten or meadow hay should be given to balance the ration, and molasses should be added to the diet.

Ewes should be compelled to exercise by driving daily if necessary, so that they do not become too fat and sluggish. Hard droving over long distances should be avoided. Allowing sheep access to a fallow paddock as well as a grass paddock, enables them to obtain more exercise and a change from the rank feed.

It should be noted that pregnancy toxaemia (or lamb sickness) is more likely to be prevalent in pregnant ewes in an average season than milk fever.

Owners experiencing mortality in ewes in lamb are advised to forward the internal organs from a recently dead sheep, in 2 per cent. formalin solution, to the Director, Veterinary Research Institute, Parkville, N.2. Spencer-street Railway Station, at the same time advising the Director of its despatch, so that diagnosis can be made.

Pig Feeding

By L. A. Downey, H.D.A., Pig Expert

THE following notes on pig feeding are brief recommendations, based on present knowledge of the principles of nutrition and economic factors associated with pig production in Victoria. They are designed to answer some of the questions frequently asked by the practical pig feeder. For more detailed information on the principles of nutrition and analyses and nutritive values of foods, readers are referred to the free pamphlet "Foods and Feeding," by A. C. T. Hewitt, M.Agr.Sc., published by this Department.

The pig raiser's main objective in keeping pigs is to convert into pork, and market at a profit, the various products of the farm which are not so readily marketable in their original form. For example, the dairy farmer sells his separated milk through his pigs, and the grain farmer sells some of his grain through pigs when they can show a greater return than the grain market. Having satisfied himself that pigs provide a good return for the available farm products, the grower should then endeavour to use those foodstuffs in a manner that will allow the pigs to convert them to pork most efficiently.

Pigs will make good use of a wide variety of foods, provided their diet contains all the necessary nutrients and food accessories. A pig food is valued firstly on its availability and cost, but such factors as chemical composition, digestibility, and palatability must also be considered.

Experiments have shown that on an average growing pigs produce 1 lb. live weight gain for a consumption of 4 lb. of concentrated foods such as meals. It has also been shown that some pigs convert their food to pork more efficiently than others, pigs of similar weight ranges, showing a variation of from 3½ lb. to 4½ lb. of food consumption for 1 lb. of live weight gain. Thus, breeding affects feeding economy. Housing, management, and the presence of parasites and disease also affect the economy of food conversion. Therefore, to obtain the best results from the available food, it is obviously necessary to have well-bred pigs and a favorable environment.

A good specimen of the Large White breed—the result of skilled breeding and feeding.

Importance of Food Supply.

Intending pig producers should calculate the quantity of foods they will require. This is not a simple matter, but as a guide, it may be assumed that when the food consists solely of meals, i.e., cereal meals, meatmeal, &c., approximately 7½ cwt. will be required to produce a bacon pig from the time the sow is successfully mated until the bacon pig is 200 lb. live weight. Approximately 10 per cent., that is ¾ cwt., of the meals would be protein and mineral supplement, and the remaining 6¾ cwt., cereals. Some portion of the meals may be replaced by pasture, root and forage crops, milk and other foods, but the whole diet must be the equivalent of 7½ cwt. of meal for each baconer produced.

Food costs form such a large part of the total costs of pig production that a careful check should be kept on the food supply. Wherever practicable, foods should be produced on the farm where the pigs are raised so as to eliminate distribution costs. The crops producing the greatest return of pig meat per acre in each locality should be grown. Pasture, root and forage crops, being usually heavy producers, should be used to the fullest possible extent.

Pig raisers who rely solely on purchased grains and meals for pigs may at any time find themselves in a precarious position, because there is no control of the price ratio between pigs and grain.

Because of their peculiar digestive system and their potentially rapid growth rate, pigs

are not adapted to a diet comprised mainly of roughage such as pasture, but require a large part of their diet in the form of concentrates, that is, meal or separated milk, the latter being a concentrate diluted with water. Fast growth in pigs is generally desirable and is, to some extent, a measure of efficiency of breeding and feeding. The daily gain in weight of pigs gradually increases with size up to about 250 lb. An average daily live weight gain of 1 lb. from birth to baconer weight of 200 lb. can be considered as satisfactory. There is considerable variation in the rate of growth of individual pigs.

Quantities of Food.

Although the quantities of foods given here are a satisfactory guide, the man feeding the pigs must be observant and use his discretion to vary these quantities when necessary. As in other phases of pig raising, the man on the job is a very important factor.

In providing a satisfactory diet for pigs the chief aim should be to ensure that none of the essential parts is lacking to such an extent as to be a limiting factor in health, growth, or production. For example, certain minimum requirements of protein-rich foods such as separated milk or meatmeal, are necessary to provide for normal growth in young pigs and production in breeding stock. Having provided the necessary minimum of each essential part of the diet, provision must be made to supply a sufficient quantity of the whole diet. Young pigs require a higher proportion of protein to carbodydrates than do older pigs, and this requirement may be conveniently met by giving a constant allowance of protein-rich food and increasing the allowance of carbohydrate-rich food throughout the pigs' growing period.

Rationing.—A Convenient Method.

Young pigs, from weaner to baconer stage, should be given ¾ gallon of separated milk or ½ lb. of a protein-rich concentrate per head daily, together with as much cereal meals as they can consume, which will be approximately 1 lb. daily for each 25 lb. live weight. This may be achieved by bringing young pigs to a full ration, then increasing their allowance of cereal meals each week by ¼ lb. per head daily.

Breeding sows when dry require ¾ gallon of separated milk or ½ lb. of protein-rich concentrates, and from 4 to 6 lb. of cereal meals per head daily. Sows suckling litters require approximately double these quantities. Service boars require about the same quantity as dry sows.

The quantities of protein-rich concentrates or separated milk and of cereal meals may be reduced when good young pasture is available to pigs. Also part of the cereal meal allowances may be replaced by other foods such as root crops, kitchen refuse, separated milk, butter-milk, or whey when these foods are available at a lower cost than cereal meals.

Cereal Grains and By-products.

Wheat, barley, maize, oats, and pollard are the cereal meals most commonly used in pig feeding. Oats should not be used to make up more than 25 per cent. of the total cereal allowance as its fibrous husk limits its food value for pigs.

The relative values of the cereal grains and pollard are readily calculated by the method propounded by H. J. Geddes, M.Agr.Sc., Dip.C.A.C., which takes into consideration the nutritive values, known technically as starch equivalents, and the bushel weights of the foods. The relative values per unit are obtained by dividing the prices per bushel of wheat by 43, of barley by 36, of maize by 43, of oats by 25, and of pollard by 14. For example, if wheat costs 4s. per bushel its cost per unit is 48d. ÷ 43 = 1.1d., and if barley costs 3s. 8d. per bushel its cost per unit is 44d. ÷ 36 = 1.2d.; at those prices wheat is shown to be cheaper per unit than barley.

Cereal meals do not supply all the necessary proteins, minerals, and vitamins required by pigs, and so they must be supplemented with other foods. These are dealt with under milk by-products and meatmeal. Methods of feeding cereal grains are dealt with under preparation of foods and self-feeding.

Milk By-products.

Separated milk is the best known food for providing the protein-rich portion of the pigs' diet, and when used in the small quantities as shown previously, it balances the cereal meals. When separated milk is plentiful it may be used in larger quantities to replace some of the cereal meals. In such cases 1 gallon of separated milk will replace 1 lb. of meal. The smaller the quantity of separated milk in the pigs' diet the greater is the return per gallon. Three-quarters of a gallon per head daily will balance all the grain a growing pig can eat. Even 1 pint of milk per pig daily

Pasture conditions are most favourable for the development of future breeding sows.

will give beneficial results with young pigs, and so the available milk should be divided among all the young pigs. But when the supply is very limited the milk should be given to pigs just after they are weaned, and when less than ¾ gallon per pig daily is available other protein-rich foods should be used as a supplement.

When it is fresh and undiluted, butter-milk has a similar feeding value to separated milk. Butter-milk, however, is frequently diluted with water, and also excessively soured before it is fed to pigs, and therefore in practice it is rarely as valuable as separated milk.

Whey is not rich in protein, but is valuable for its sugar and mineral content, and may be used to replace part of the cereal meals in pigs' diet. Approximately 1½ gallons of whey may replace 1 lb. of cereal meal. Whey alone does not give satsifactory results, and should be supplemented with a concentrate mixture such as pollard or ground barley 80 lb., meatmeal 10 lb., linseed meal 5 lb., lucerne chaff 5 lb., at the rate of 2 lb. a head daily for pigs from weaning to baconer stage, 1 lb. daily for dry sows, and 4 to 6 lb. daily for sows with litters.

Milk by-products from cows other than those which have passed the tuberculin test should be pasteurized or boiled before they are fed to pigs, as a safeguard against infection. When milk by-products provide more than half of the total diet of pigs, sufficient minerals, to satisfy the pigs' requirements, will be provided. But when milk foods are used only in the limited quantities shown to be sufficient to provide the protein to balance cereal meals, then a mineral supplement composed of 4 parts of ground limestone and 1 part of salt should be given to the animals at the rate of 1 oz. per head daily for pigs from weaner to baconer stage and for dry sows, and 2 oz. per head daily for sows with litters.

When fed to pigs, milk by-products should be in a fresh condition. The holding of milk in an unclean container, which is the usual method on many farms, causes uncontrolled souring, and thus the food value of the milk may be reduced. In addition, this practice may lead to putrefaction, which causes poisoning in pigs.

Meatmeal and other Milk Substitutes.

Although separated milk is an excellent food for pigs it is not an essential ingredient of their diet, and may be satisfactorily replaced by meatmeal or some other protein-rich food. One ounce of high grade meatmeal will replace 1 lb. of separated milk in balancing cereal meals in the pigs' diet. Other protein-rich foods are blood meal, peanut meal, linseed

meal, and cocoanut meal. A combination of one or more of these foods with meatmeal gives better results than meatmeal alone.

The following protein-mineral supplement is suggested for providing the required protein and minerals for a ration composed largely of cereal meals when separated milk is not available:—

Meatmeal, 50 lb.; peanut meal or linseed meal, 20 lb.; lucerne chaff, 20 lb.; ground limestone, 8 lb.; and salt, 2 lb. This supplement may be used in rations in the quantity already shown under the heading of "Rationing," or it may be mixed with cereal meals, adding 15 per cent. for pigs from weaning up to 100 lb. live weight, 10 per cent. for pigs from 100 to 150 lb. live weight, and for breeding sows, and 5 per cent. for pigs over 150 lb. live weight. Similar mixtures may be used when self-feeding is practised.

Roots and Similar Bulky Foods.

Feeding costs can be reduced and pig raising made a more stable enterprise when heavy yielding crops such as mangels, sugar beets, swedes, artichokes, and carrots, or waste potatoes, pumpkins, waste fruit, and kitchen refuse can be provided and used liberally in the pigs' diet. The nutritive values of such foods vary, 4 lb. of potatoes or 10 lb. of the more watery foods such as mangels, being equal to 1 lb. of cereal meals in a properly balanced diet. Where conditions are favorable for the production of such heavy yielding crops their returns of pork per acre are greater than the returns from grain crops.

A satisfactory method of feeding this class of food is to give each pig after weaning its allowance of ¾ gallon of separated milk or ½ lb. of protein-mineral supplement, and up to 2 lb. of cereal meals daily according to appetite, and then, keeping these quantities constant, allow the pigs to eat the bulky foods according to their increasing appetites. Dry sows require the same amounts of concentrates as young pigs, and sows with litters require double the amounts, in addition to all the bulky foods they can consume.

Pasture.

Pig raisers frequently debate the value of grazing pigs on pasture or forage crops, and in doing so value the pasture in terms of quantity of milk or grain it will save. This is an important point, but not so important as the nature of the nutrients which the pasture provides.

First class pasture will provide approximately four-fifths of the food requirements of mature pregnant sows, but it is not sound practice to force young growing pigs to take even half of their food requirements as pasture. The modern young pig is designed for handling concentrated foods such as grain, milk, and meatmeal, and converting them quickly into pork. If these concentrates do not form the larger part of the diet the rate of growth is retarded, therefore pasture cannot be expected to economically provide more than about one-tenth of the food requirements of young pigs.

Young pasture is comparatively rich in protein, minerals, and vitamins. Deficiencies of these materials predispose pigs to infection and also restrict growth and production, therefore access to pasture is an easy form of insurance against dietetic deficiencies.

When good green pasture is not available it may be replaced in the diet by good quality lucerne or clover chaff, to the extent of 5 per cent. by weight for young pigs and 10 per cent. for breeding sows. These legume hays provide necessary minerals, vitamins, and protein which help to balance cereal grains.

Preparation of Foods.

It will pay to prepare foods for pigs only if the cost of preparation can be justified by increased gains. To ascertain the increased gains resulting from the preparation of foods numerous trials have been conducted, and the results show generally that little preparation is necessary with most pig foods.

In most circumstances it will pay to grind grains fairly finely, but not to a powder. Boiling of grains or their meals generally reduces their feeding value. If, however, palatability of grains or meals can be increased by steaming or soaking, the practice may be desirable, but when grains or meals are fed wet they should only have sufficient water added to make a thick gruel. More water may be given separately as a drink, but it is not wise to force pigs to drink more water than they require by mixing large quantities with their food. Potatoes give much better results if boiled; kitchen refuse and meat offal should be boiled to prevent infection. The pasteurizing or boiling of milk is a wise precaution, and should always be adopted in respect of skim milk or whey obtained from factories.

Sows and litters enjoying a run on fresh grassland.

Mixed meals can be purchased in cube form, and are conveniently fed dry, either in troughs or spread on pasture or clean hard floors with practically no waste.

How many Meals Daily?

Breeding sows when dry are best run on pasture. They should be given a supply of drinking water or milk by-products, and fed their allowance of concentrated foods in one or two meals daily. Service boars should be fed twice daily. Breeding sows which are suckling litters should be fed two or three times daily, allowed to graze where practicable, and given as much water or milk to drink as they desire.

Sucking pigs, for reasons explained later, should be given access to soil from the time they are a few days old. After they are three weeks old they should be fed in a "creep," preferably with a self-feeder or trough of dry meals, and have water or fresh separated milk available at all times. Growing pigs, from weaning till marketing, should be hand-fed two or three times daily, or given access to a self-feeder.

Self-Feeding.

Self-feeders are appliances which hold several days' food supply and allow it to run into a trough where the pigs can take it at will without undue waste. Self-feeders save labour, and ensure that the pigs have sufficient food at all times, and in this respect are probably more efficient than hand feeding in troughs carried out by an unskilled person. Most experiments conducted to compare self-feeding with hand-feeding have shown a small saving of food in favour of hand-feeding, but it should be noted that in experimental work self-feeding is compared with efficient hand-feeding done by skilled workers.

When it is desired to use cereals to the utmost extent, self-feeding may be favorably considered. Self-feeding is not practicable for breeding sows when they are dry, as they tend to become too fat, and do not make full use of pasture when self-fed.

One foot of trough space on a self-feeder is sufficient for four pigs. Thus there is a considerable saving of troughing, and as pigs have 24 hours a day in which to feed, there is no rushing at troughs. Large numbers of pigs can be run in the one lot when self-feeders are used. Although it is most desirable that cereal grains should be ground when they are to be hand-fed to pigs in several meals daily, there is not such a saving through grinding when the grains are self-fed, as the pigs have ample time to take and chew the grain at the self-feeders.

Feeding Suckers.

Pigs usually nose at the soil, provided they have access to it as they should, within a few days of their birth, and apparently they obtain iron from the soil which prevents anemia. Anemia occurs when suckers are kept on clean floors, and do not have access to soil or are not artificially fed on some form of iron.

Apart from their desire to nose in the earth and nibble at green grass suckers do not eat any food other than the sow's milk until they are nearly three weeks old. From that time on they will eat solid foods and drink milk or water from troughs, and should be encouraged to do so as they make the most economical use of foods at this stage of their growth, and this supplementary feeding produces extra weight which is so desirable at weaning time.

To encourage suckers to feed from the time they are three weeks old a "creep" should be provided into which they may go away from their mother and help themselves to food and drink. Cereal meals and the protein-mineral supplement described previously (the latter should comprise 20 per cent. of the ration), may be fed dry in a low trough or a self-feeder. A trough of water should always be available to the pigs. When separated milk is available it may be used, in which case the protein-mineral supplement can be deleted from the cereal mixture. Care should be taken to keep troughs clean.

Feeding Orphan Pigs.

When, for any reason, sucking pigs are deprived of their mother's milk they may be successfully reared by artificial feeding. A simple plan which has given good results is to give the pigs whole cow's milk at about body temperature and as fresh as possible until they are four weeks old. From four weeks separated milk may be added gradually in small quantities until at eight weeks they will be having all separated milk. When the pigs are three weeks old they should be given a trough containing a dry mixture of cereal meals and the protein-mineral supplement, and have access to drinking water. Access to pasture is very desirable at all times.

In feeding the milk to the orphan pigs it should be given in six feeds daily for the first week, then the number of meals can be reduced gradually until the pigs are three weeks old, when they should be fed three times a day in addition to the meal and water which are provided. The milk is best fed in a shallow dish, of glazed earthenware or enamel which can be washed clean after each meal. The pigs can be taught to drink by dipping their noses in the milk a few times during the first two meals, and a little patience at this time is better than feeding from the bottle with the aid of a rubber teat.

Effect of Foods on Carcass Quality.

Although the pig raiser's main object in pig feeding is to produce market pigs economically, he must also consider carcass quality, which is affected by breeding and feeding. Many pigs are too fat when marketed as porkers and baconers. While this is caused primarily by using the incorrect type of breeding stock to suit the feeding, the trouble may be overcome by altering the feeding to suit the breeding.

Under normal feeding conditions, pigs reach a desirable degree of maturity, which gives the good meaty carcass required by the trade, at some particular stage of their growth, and if the pigs are carried past the stage of growth on full rations they will become too fat and thick in conformation. Therefore the general practice should be to market pigs when they reach the desired condition, irrespective of their weight. If, however, circumstances make it necessary to carry the pigs on to heavier weights, the rations should be limited to give a slower rate of growth and reduce the tendency to fatten.

Foods containing a high percentage of oily fats have a tendency to produce soft-fatted pigs which are undesirable as pork or bacon. Fish and fish oils give an undesirable taint to pigs' carcasses. Cod liver oil may cause rancidity and softness in the fat of bacon, and should not be fed to pigs within about three months of the time they are slaughtered. Slow-growing pigs are more liable to produce soft fat than fast-growing pigs.

Water.

Pigs require water for drinking purposes except when they are receiving large quantities of milk by-products in liquid form. Their average requirements when on dry food are approximately 1 gallon daily for each 100 lb. of live weight.

Live Stock Notes

Reminders for August—September

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Dairy Cattle.

FOLLOWING the good July rains, excellent pasture growth may now be expected throughout the dairying districts, but, for some considerable time, this pasture will be very watery and immature. It should, therefore, not be depended upon to wholly maintain the milking herd and springers. From the previous season, there is often a considerable amount of dry carry-over feed on the pasture which helps to balance this early new season's growth.

This year, when the season broke, most pastures were relatively bare and contained very little carry-over feed, making it desirable to feed some mature supplementary fodder. The best supplementary fodder is well-cured hay or chaff. Heavy milking cows should also receive some additional concentrate supplements. The watery, immature pasture is rich in proteins, and, for this reason, foods such as ground oats, barley and wheat and pollard, which contain large amounts of carbohydrate, may be fed in larger proportions, while the proportion of protein meals, such as meat, linseed, peanut, coconut, and maize germ meals, may be reduced to about 10 per cent. of the total concentrate supplement.

Although they may milk fairly well, unfed cows, grazed on such immature pasture, scour badly, and lose much condition. It is seldom realized, however, that these unfed cows also tend to lose strength and their resistance to many diseases, such as mastitis, sterility, and milk fever. The first slogan in the prevention of disease should be: "Keep the cows in good condition by good feeding and good management."

A suitable type of hay shed used at the Salesian College, Sunbury.

Sheep.

The advantages of pasture improvement to sheep men have been shown in a survey of sixteen sheep farms with a total area of just over 16,000 acres in the Apsley district by Mr. J. E. Harrison, B.Agr.Sc., of the extension service of the Australian Estates Company. Apsley is situated along the South Australian border in the north-west corner of the Western District, and is mostly undulating country with a 23-inch rainfall. Pasture improvement in that district consists principally of sowing 2 to 3 lb. of subterranean clover seed per acre, and of annual top-dressing with about 140 lb. of superphosphate per acre.

Before the advent of pasture improvement, the district was carrying on the average between five and six sheep to 10 acres. The area now covered by these sixteen farms would have, therefore, been carrying between 8,000 and 9,000 sheep. One-third of the area has now been improved, one-sixth is undergoing improvement or in crop for supplementary

feed, and the remainder (one-half) is still unimproved native pasture, but there are over 24,000 sheep or 1½ sheep to the acre on the area.

By assuming that the native pasture still has the same average carrying capacity, Mr. Harrison has calculated that the improved pastures are carrying 2.83, nearly 3, sheep to the acre. Another very interesting calculation showing the advantages of improved pastures revealed that this improved pasture is annually producing nearly 28 lb. of wool per acre, whereas, when held in large station properties over twenty years ago, the area was producing about 4 lb. of wool per acre.

In the Apsley district, half of the farmers still prefer Merino sheep, but the others have Corriedales and crossbreds. Quite a lot of lambs are sold by the owners of these latter breeds, but the lambs have not been considered by Mr. Harrison in his calculations. Farmers who rear and fatten lambs have larger portions of their properties improved.

Although no regular systems of rotational grazing are practised it was found that the improved pastures are subdivided into paddocks with an average area of 50 acres. The pastures undergoing improvement average 100 acres per paddock, while the native pastures are subdivided into paddocks of 174 acres.

Generally, the most prosperous farmers are combining fat lamb production with wool growing, and have the largest areas of improved pasture.

Horses.

Increased hand-feeding of horses will still be necessary for some considerable time. Where available small quantities of lucerne chaff can be added to shandy or oaten chaff. Such mixed chaff makes a better food than either lucerne or cereal chaff fed separately.

Stallion owners should see that horses doing stud work are liberally fed, well groomed, and given regular exercises. At this time of the year especially, extra attention to grooming should be given.

Where the pastures are still dry, the desirable green feed for foals, young horses, or brood mares can be partially made good by feeding some good quality, green, leafy lucerne chaff. In the past cod liver oil has been used in this respect, but it is practically unprocurable at the present time.

Crushed yellow maize has given good results when fed to horses, and can be used to replace some of the oats where green feed is scarce, but at present prices oats is a cheaper feed.—W. D. Shew, B.V.Sc., Senior Veterinary Officer.

Poultry.

The Egg and Egg Pulp Marketing Board advises that every egg that can be possibly produced is now required for export to Great Britain. Annual egg imports to Great Britain have been approximately 252 million dozen (3,024,000,000 eggs), of which Victoria supplied only 1 per cent. More than two-thirds of the eggs imported into England came from countries now occupied by Germany, so that Britain must obtain her egg supplies from other sources. It should be possible to greatly increase the production of eggs in Victoria without danger of an over supply.

According to the Egg and Egg Pulp Marketing Board, only 40 per cent. of the total eggs produced in Victoria last year were of export standard. There appears to be little reason why this percentage cannot be doubled. Any producer who does not send all his eggs of export quality to the Board will be failing in his duty to the Empire since Great Britain requires every available egg. It is necessary for export eggs to be scrupulously clean.—H. F. Clinton, Poultry Export.

Bees.

All bee hives should be overhauled and the quantities of stored food noted during the first fine weather in August. As breeding will have started, there will be a heavier demand on the food supplies, and in cases where there is likely to be a shortage, sugar syrup or honey should be fed. Mouldy combs and those affected with wax moth should be removed and fumigated to destroy the wax moth larvae. All spare combs, hives, and supers should be overhauled.—J. W. Thomlinson, Apiary Inspector.

Pigs.

A sale of stud pigs and the judging of porker and baconer competitions conducted by the Victorian Branch of the Australian Stud Pig Breeders' Society, the Royal Agricultural Society, and the Department of Agriculture will be held at the sheep pens of the Melbourne City Abattoirs on the

18th, 19th, and 20th September. Such an exhibition of pigs is unique in Australia, and, in the absence of a Royal Show, a good display of sale pigs is expected. Nominations already received indicate that there will be heavy entries in the porker and baconer competitions, which will be judged on litter weight, rate of growth to slaughter, and carcass quality.

Of the two pigs comprising each entry of porkers and baconers, one animal will be killed and its carcass and the remaining live pig will be on view, and should provide a valuable object lesson for pig breeders. The live pigs in these competitions will be included among the sale pigs, and should be sought after by pig breeders who value records of performance as much as pedigree, because these pigs are from recorded and carcass tested litters.

Pigs will be penned on Wednesday, 18th September, when the test pigs will be slaughtered. Carcasses will be judged, and sales will commence on Thursday, 19th September. The pig expert, Mr. L. A. Downey, will be in attendance, and will be prepared to assist prospective buyers in the selection of stock.

Questions and Answers

The following questions have been received from correspondents and it is considered that the replies will be of general interest.

QUESTION.—My pigs are rooting the ground badly, and it has been suggested that the tip of the snout be cut off. Would it be wise to cut this off a twelve-months-old pig?

ANSWER.—Cutting off the tip of the snout of mature pigs does not stop them from rooting. The most effective treatment for such pigs is to place a wire through the cartilage of the pigs' snouts. A piece of No. 14 gauge wire about 6 inches long should be bent to the shape of a hairpin and the ends sharpened. The points should be pushed down through the ring of the snout with pliers, and the ends turned up and twisted together. It has been found that, if the tips of pigs' snouts are cut off before they are six weeks old, they do not acquire the rooting habit.

QUESTION.—What is the best protein food for pigs and the best mineral mixture, and how do you feed them?

ANSWER.—For pigs fed largely on cereal grains, a mineral mixture of four parts of ground limestone and one part of salt is recommended. This may be self-fed to pigs.

When pigs are to be fed mainly on cereal grain or meals, the following protein-mineral supplement is recommended:—Meat meal, 50 lb.; peanut or linseed meal, 20 lb.; lucerne chaff, 20 lb.; ground limestone, 8 lb.; salt, 2 lb.

This mixture should be added to ground wheat, barley, or pollard at the rate of 15 per cent. for pigs from weaning to 100 lb., 10 per cent. for pigs from 100 lb. to 150 lb. and for breeding sows, and 5 per cent. for pigs over 150 lb. live weight.

QUESTION.—Will unlimited quantities of whey harm sucker pigs and weaners, and, if so, what is the maximum quantity that may be fed?

ANSWER.—When it is desired to feed large quantities of whey to pigs, the best method is to allow each pig, from weaning time onward, ½ lb. meat meal and up to 2 lb. of grain daily, and in addition as much whey as they can drink. At weaning time each pig would consume ½ lb. of meat meal and approximately 1 lb. of grain daily, in addition to some whey, and when about 50 lb. live weight each pig would consume ½ lb. of meat meal and 2 lb. of grain daily. This allowance of concentrates should not be increased, but the whey allowance should be increased according to the appetite of the pig. Sucking pigs should be encouraged to feed from a trough from the time they are three weeks old, and it is suggested that they be given a dry mixture of equal parts of meat meal and barley meal, with access to fresh whey in a separate trough.

Poultry Feeding Tests, 1939-40

Results at Werribee

By W. O. Pederick and A. G. Clark

High production birds such as these can be maintained only by adopting an intelligent system of breeding and feeding.

EXTENDING over a period of twelve months from 1st April, 1939, to the 31st March, 1940, poultry feeding tests were conducted at the State Research Farm, Werribee. For the purpose 500 pullets hatched during August and September, 1938, were used, consisting of five pens of Australorps with 50 birds in each pen, and five pens of White Leghorns similarly divided. All the birds were kept confined, i.e., there was no outside run, although succulent green food was supplied regularly and shell grit was always available.

The object of these tests was to determine, if possible, the amount of meatmeal which, when added to wet mash fed in conjunction with ample and regular supplies of greenstuff and a variety of grain, would give the best results for egg production. The wet mash, which was the same in each pen with the exception of the meatmeal, consisted of bran 1 part by weight, pollard 2 parts, salt 1 per cent. Ten per cent. meatmeal is the amount generally used, but in these tests the following percentages were added to the mash:—Nil, 5 per cent., 7½ per cent., 10 per cent., and 15 per cent. The meatmeal which was used is registered under the Stock Foods Act as containing 63 per cent. protein.

The wet mash was fed each morning, and the grain mixture, which consisted of wheat 3 lb. (3 parts by measure), oats 9 oz. (1 part), maize 12 oz. (1 part), and barley 12 oz. (1 part), was fed in the litter each afternoon at the rate of 6½ lb. per pen (approximately 2 oz. per bird). A bountiful supply of good quality freshly cut green feed was fed regularly at midday. No record was kept of the quantity of the greenstuff consumed by each pen, or of the nature of the greenstuff, but it consisted of a variety of fodders, including very good quality succulent clippings from mixed-pasture experimental plots which contained much clover, and also young green lucerne, barley, and oats.

The accompanying table gives particulars of the food consumed, excluding the greenstuff, the eggs laid and their value, the profit over food cost, and the mortality in each pen. Those birds that died were replaced. The cost of food was arrived at by taking the wholesale prices published in the daily press, and all the eggs laid were valued at wholesale "hen" egg prices. No deductions have been made for marketing charges, &c.

Results.

Notwithstanding the fact that the percentage of meatmeal in the mash varied so much, the egg production was consistently good throughout the test, with little variation between pens, showing an average of 194.1 eggs per bird for the 500 birds. This is believed to be mainly due to the fact that a liberal supply of good succulent greenstuff, which is rich in protein, was fed to all birds daily, and to a lesser extent to the variety of grain (wheat, oats, maize, and barley) fed in the litter each afternoon. This variety of foodstuffs enables the birds to make more economic use of the proteins supplied apart from the meatmeal. Wherever possible a variety of grain and greenstuff should be fed on the commercial poultry farm.

In both Australorp and White Leghorn sections the highest production and the highest profit over food cost were evident in the pens receiving 7½ per cent. meatmeal, and the lowest production was in the pens receiving 5 per cent. meatmeal. The second highest production for both Australorps and White Leghorns was in pens receiving more than 7½ per cent. of meatmeal, namely 15 per cent. and 10 per cent.

Test No. 20.—Werribee Feed Tests—1st April, 1939, to 31st March, 1940 (12 months).

Pen No.	50 Pullets in each Pen.	Mortality. (Birds died.)	Bran.	Pollard.	Meat Meal.	Wheat.	Oats.	Maize.	Barley.	Total Food.	Cost of Food.	Total Eggs.	Value of Eggs.	Profit over Food Cost.
		No.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	£ s. d.	No.	£ s. d.	£ s. d.
1	Australorps—Wet mash, no meat meal	5	755	1,509	..	1,410	265	352	352	4,643	12 18 11	9,686	52 5 6	39 6 7
	Average	..	..	..	..	..	..	..	..	**92·9**	**0 5 2**	**193·7**	**1 0 11**	**0 15 9**
2	Australorps—Wet mash, 5 per cent. meat meal ..	4	641	1,281	101	1,410	265	352	352	4,402	12 15 4	9,332	50 14 1	37 18 9
	Average	..	..	..	..	..	..	..	..	**88·0**	**0 5 1**	**186·6**	**1 0 3**	**0 15 2**
3	Australorps—Wet mash, 7½ per cent. meat meal ..	4	661	1,321	160	1,410	265	352	352	4,521	13 5 7	10,198	55 14 11	42 9 4
	Average	..	..	..	..	..	..	..	..	**90·4**	**0 5 4**	**204·0**	**1 2 4**	**0 17 0**
4	Australorps—Wet mash, 10 per cent. meat meal ..	6	593	1,186	198	1,410	265	352	352	4,356	13 0 8	9,568	51 19 0	38 18 4
	Average	..	..	..	..	..	..	..	..	**87·1**	**0 5 3**	**191·4**	**1 0 9**	**0 15 6**
5	Australorps—Wet mash, 15 per cent. meal meal ..	7	560	1,121	297	1,410	265	352	352	4,357	13 8 5	9,740	53 1 7	39 13 2
	Average	..	..	..	..	..	..	..	..	**87·1**	**0 5 4**	**194·8**	**1 1 3**	**0 15 11**
6	White Leghorn—Wet mash, no meat meal ..	4	721	1,442	..	1,410	265	352	352	4,542	12 14 2	9,488	50 19 5	38 5 3
	Average	..	..	..	..	..	..	..	..	**90·8**	**0 5 1**	**189·8**	**1 0 5**	**0 15 4**
7	White Leghorns—Wet mash, 5 per cent. meat meal ..	3	636	1,273	100	1,410	265	352	352	4,388	12 14 6	9,400	51 1 10	38 7 4
	Average	..	..	..	..	..	..	..	..	**87·8**	**0 5 1**	**188·0**	**1 0 5**	**0 15 4**
8	White Leghorns—Wet mash, 7½ per cent. meat meal ..	5	687	1,374	167	1,410	265	352	352	4,607	13 10 2	10,053	53 14 6	40 4 4
	Average	..	..	..	..	..	..	..	..	**92·1**	**0 5 5**	**201·1**	**1 1 6**	**0 16 1**
9	White Leghorns—Wet mash, 10 per cent. meat meal ..	4	644	1,287	214	1,410	265	352	352	4,524	13 9 10	9,948	53 5 4	39 15 6
	Average	..	..	..	..	..	..	..	..	**90·5**	**0 5 5**	**199·0**	**1 1 4**	**0 15 11**
10	White Leghorns—Wet mash, 15 per cent. meat meal ..	5	610	1,220	323	1,410	265	352	352	4,532	13 18 8	9,619	51 19 6	38 0 10
	Average	..	..	..	..	..	..	..	..	**90·6**	**0 5 7**	**192·4**	**1 0 9**	**0 15 2**
	Totals—500 birds ..	..	..	..	..	..	..	..	..	44,872	131 16 3	97,032	524 15 8	392 19 5
	Average	..	..	..	..	..	..	..	..	**89·7**	**0 5 3**	**194·1**	**1 1 0**	**0 15 9**

Notes.—Average price of eggs, 1s. 3½d. per doz. Food costs per dozen egg, 4d. Food consumed per egg laid, 7·4 oz. Food consumed per day, 3·9 oz. Cost of food per bird per week, 1·2 pence.

respectively. Although larger variations between the egg production of the different pens may have been expected, the high yields for each pen, including those not receiving meatmeal, are attributed largely to the liberal supply of good quality greenstuff. This greenstuff, as already described, was considerably better than that usually fed by poultry farmers.

The birds were kept under close observation throughout the test, but there appeared to be very little difference in the health and general appearance of the birds in the different pens.

As the Australorps and the White Leghorns in this test were treated in the same way, a comparison between the two breeds is of interest. The average amount of food consumed was 89.1 lb. per bird in the Australorps, and 90.4 lb. in the White Leghorns, and the egg production was practically the same. The table opposite shows the average monthly production of each breed.

In 1938-39 similar tests were conducted with dry mash. Although each system was tried in a different year the fact that all other conditions were similar makes a comparison between the results of wet mash and dry mash feeding very interesting.

The table at the foot of the previous column gives a summary of the results.

Average Monthly Production of 250 Australorps and 250 White Leghorns. (1939-40.)

Month.	Australorps.	White Leghorns.
	Eggs per bird	Eggs per bird
April	14·5	13·9
May	15·6	15·3
June	15·1	14·0
July	15·7	14·1
August	17·0	16·2
September	19·0	19·7
October	20·0	21·0
November	18·1	19·6
December	16·6	17·3
January	15·8	17·6
February	14·2	13·6
March	12·5	11·7
Average per bird for 12 months ..	194·1	194·0

Comparison Between Wet and Dry Mash.

	1938–39 Dry Mash.		1939–40 Wet Mash.	
	Food consumed per bird.	Eggs laid per bird.	Food consumed per bird.	Eggs laid per bird.
	lbs.		lbs.	
Australorps—				
Pen 1.—No meat meal ..	94·0	186·2	92·9	193·7
Pen 2.—5 per cent. meat meal	91·6	186·2	88·0	186·6
Pen 3.—7½ per cent. meat meal	92·0	197·6	90·4	204·0
Pen 4.—10 per cent. meat meal	92·6	185·9	87·1	191·4
Pen 5.—15 per cent. meat meal	89·2	192·8	87·1	194·8
Average for 250 birds	91·9	189·7	89·1	194·1
White Leghorns—				
Pen 6.—No meat meal ..	94·5	195·6	90·8	189·8
Pen 7.—5 per cent. meat meal	92·0	201·0	87·8	188·0
Pen 8.—7½ per cent. meat meal	92·0	199·9	92·1	201·1
Pen 9.—10 per cent. meat meal	91·5	199·9	90·5	199·0
Pen 10.—15 per cent meat meal	90·5	207·1	90·6	192·4
Average for 250 birds	92·1	200·7	90·4	194·0
Average for 500 birds both breeds	..	195·2	..	194·1

Conclusions.

A combination of the results obtained from these meatmeal feeding experiments during the two years 1938-39 and 1939-40 is shown in the following table:—

Percentage of Meatmeal included in Mash.	Average egg yield per bird per year for Australorps and White Leghorns during 1938–39 and 1939–40.
Nil	191·3
5	190·5
7½	200·7
10	194·1
15	196·8

This table shows that the best results were obtained when a bran and pollard mash containing 7½ per cent. meatmeal was fed with mixed grain and high quality greenstuff. It is also noted that birds receiving 7½ per cent. meatmeal produced 200.7 eggs, while those receiving more than 7½ per cent. (10 and 15 per cent.) produced 195.4 eggs, and those receiving less (nil and 5 per cent.) produced 190.9 eggs only. With a less liberal or poorer quality greenstuff more meatmeal is advisable. In such cases 10 per cent. meatmeal is recommended.

Pregnancy Toxaemia of Sheep

By H. M. Elder, B.V.Sc., Veterinary Officer

PREGNANCY toxaemia, sometimes known as "lamb sickness," is one of the commonest causes of mortality in pregnant ewes. It is also known as pregnancy paralysis, "twin-lamb disease" or "twin disease." These latter names were derived from the fact that affected ewes are frequently found to be carrying twin lambs. This, however, is by no means always the case, as it often occurs in ewes carrying only a single lamb.

The disease may occur at any period within a month prior to lambing. Affected ewes, in the early stages, appear rather mopey, and walk with a rather stiff, high-stepping gait. They stand about by themselves, develop a stupid, aimless appearance, and become apparently blind and will walk into obstacles. They grind their teeth, and show a thick yellowish discharge from the nostrils. After two or three days, they go down, and become paralysed, sink into a semi-coma, and gradually die.

On post-mortem examination, the ewe is, of course, found to be carrying one or more well-developed lambs. The most noticeable abnormality is the condition of the liver. This is greyish-yellow, or putty-coloured, and is very crumbly. The abdominal fat is plentiful, and shows white, flaky patches scattered through it. The heart muscle is very flabby. The paunch is not full, and is rather flabby.

Nutrition Important.

The disease occurs when there is a falling-off in the nutritional value of the feed during the term of pregnancy. It is most common during a dry autumn, when the dry feed available at the time the ewe is heavy in lamb is less nutritious than during early pregnancy. Following a normally good season, there is good feed at the end of the year, at the time ewes are joined with the rams. Even though the feed may be dry, it is of high nutritive value, and the ewes are in good condition.

If there are satisfactory early rains, there is a plentiful growth of green feed before the nutritive value of the dry feed has deteriorated greatly, so that the ewes have sufficient nutritious feed to carry them through to lambing time. If, however, good rains do not come till late in the season, the dry feed deteriorates throughout the autumn, and even though there is a quantity of dry grass or stubble, and "dry" sheep or wethers may do well on it, it has not sufficient food value for ewes heavy in lamb, and they develop "lamb sickness."

It is this dropping of the plane of nutrition during the term of pregnancy that causes the onset of the disease. If the ewes are on light feed and only in hard, store condition at mating time and during early pregnancy, they are less liable to lamb sickness later on, if there is a dry autumn, than those which are in fat condition early in pregnancy.

Treatment.

Treatment of the disease is not very successful, as, by the time symptoms are shown, the liver is too badly affected to perform its functions in the body mechanism, and cannot be restored to normal. Drenching twice daily with a cupful of molasses, diluted with an equal quantity of water, may effect a cure in very early cases.

The disease can be prevented, however, by good management. Anything in the nature of a check in the nutritional value of the food during pregnancy should be avoided.

When ewes are on dry feed, this should be supplemented by hand-feeding, which should be commenced as soon as the food begins to deteriorate, instead of waiting till some of the flock are affected. Oats, good oaten chaff, good quality grass hay, or lucerne hay are all suitable supplementary fodders.

Where self-feeders or troughs are used, these should be sufficient in number, as, when there is little other feed available, the stronger sheep are inclined to crowd out the weaker ones, which do not get sufficient feed. It is better to draft off the weaker sheep into a separate paddock. Also, with self-feeders the sheep are inclined to congregate around these all day,

and do not get sufficient exercise. It is a good plan to have feeders at the opposite end of the paddock to the dam or water supply, so that the sheep obtain exercise by travelling to and fro.

Molasses added to the diet is of great value in assisting to prevent the disease. If diluted with water, it can be given on chaff or hay, or put out in tubs or kerosene tins. Molasses is also obtainable in more solid form of about the consistency of pitch. It is available in tins, which can be placed out in the paddock for the sheep to take the molasses as they desire it. It is not a good idea to give molasses by mixing it with salt, as, to obtain sufficient molasses, the sheep must take too much salt.

Pregnancy toxaemia also occurs in ewes on soft green feed where they obtain insufficient exercise. In a season in which there is a prolific growth of soft green feed in the autumn, the ewes become over-fat during pregnancy, and as they become heavy in lamb, they do not take sufficient exercise. Although the feed is present in quantity, it does not constitute a balanced ration, and the same symptoms develop as when the ewes are on poor dry feed.

To prevent the disease under these circumstances, oaten chaff, meadow hay, or lucerne hay should be given as a supplement to the green feed. Molasses is also useful as an aid to prevention. The ewes should be made to exercise by driving every day. This should be commenced at least six weeks before lambing starts. It should be noted that ewes which have been on good green feed till near lambing, are liable to become "lamb-sick" if suddenly moved on to poorer feed.

The object to be aimed at is to commence with ewes in store condition, and *gradually* improve the plane of nutrition throughout the term of pregnancy.

The actual process by which the disease is produced is unknown, but it is probably connected with the fact that the liver is thrown out of action and is unable to perform its functions in the body mechanism. Normally, the liver acts as the body filter and detoxifying agent; and also as a storehouse for glycogen, or animal starch, necessary for the system.

When the sheep receives an adequate balanced diet, the liver maintains this storage of glycogen from the carbohydrate in the diet; but when there is insufficient carbohydrate, the store of glycogen in the liver is used up, and fat from the carcass fat is used to replace it, with the result that the liver becomes very fatty, and cannot carry on its work of filtering out the body impurities. Consequently, instead of toxins from the large intestine, and from the foetus in the uterus, being filtered out of the system, they are absorbed by the blood stream, and the animal dies from toxaemia.

It should be noted that death of the ewe is not caused by the lamb or lambs dying in the womb, because quite commonly the lamb does not die until the ewe dies. If a ewe is killed in the final stages of the disease, and the uterus opened immediately, it is often found that the lamb is still alive.

It must be pointed out that the above hypothesis is advanced only as a possible explanation of the process by which the disease is produced.

Do Not Confuse with Other Diseases.

In making a diagnosis of pregnancy toxaemia, it should be remembered that there are certain other diseases which show some points of resemblance to it. During 1939, when there was an abnormally prolific growth of green feed, milk fever was very prevalent in ewes. This occurred in ewes heavy in lamb, and also in ewes with lambs at foot, even up to six or eight weeks old. The onset of this disease is more sudden than that of lamb-sickness, and is usually associated with some special factor, such as putting ewes on to very rich green feed, especially green crop, or with droving ewes some distance, or yarding them over-night. Usually a number of ewes is affected at the one time. The ewes go down very suddenly, and are more restless and nervous while down. On post-mortem, it is found that the liver is congested, and crumbles easily, but is dark-red in colour, and not greyish-yellow as in lamb-sickness. It is unlikely that this disease will be prevalent in a normal season.

Worms, especially fine hair worms, may also produce symptoms somewhat resembling those of lamb-sickness. The ewes become weak and go down as though paralysed. On post-mortem examination, it is seen that there is not much abdominal fat, and the liver is not discoloured. On making a careful examination, the fine hair worms are found in the fourth stomach and the first few feet of the small intestine. It should be realized that one condition can

[*Continued on page* 412.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

DURING late July and early August almond trees will be in bloom. Although the almond is closely allied to the peach and apricot it is unlike those fruits in one aspect, because it requires cross-pollination in order to set good crops. The varieties of almonds can be divided into three main classes, based on their periods of bloom—early, mid-season, and late blooming. The early blooming varieties include Brande's Jordan, Chellaston, and Early Jordan. These are followed by the mid-season varieties—Riverside Peerless, and Ne Plus Ultra, and in the later blooming class are found I.X.L., White Nonpareil, and Hatch's Nonpareil. In some districts and seasons the mid-season blooming varieties serve the useful purpose of cross-pollinating the late blooms of the early varieties and the early blooms of the varieties flowering later. It is better, however, if maximum crops are required, to provide varieties which synchronize in blooming.

Failure of the early blooming varieties to set good crops is not always due to inadequate cross-pollination, because at this period of the year the incidence of frosts is greater than a few weeks later when the later varieties are blooming.

If the planting of trees has not been made in such a way as to provide interpollination, then the grower must graft or bud suitable varieties on to the trees for the production of blossom in later years, and adopt the more temporary and also more arduous task of placing boughs of blossom from other varieties in vessels of water suspended in the trees.

In last month's orchard notes the control of woolly aphid was outlined, but, in addition to those recommendations, growers are urged to collect heavily parasitized twigs during the pruning season and either leave them in a heap at the base of the tree, or place them in old cases scattered throughout the orchard. The parasites hatching from these prunings will markedly increase the population of the Aphelinus wasp in the spring and summer months, and this will exercise greater control on the aphid. Growers who have found the parasite rather ineffective until the autumn are urged to adopt this practice.

Peach and apricot trees will be approaching the "pink-bud" stage, and the essential 6.4.40 Bordeaux mixture spray should be applied to control shot-hole and scab, curly leaf, and brown rot.

August is a good month to apply fertilizers to the orchard, particularly for the stone fruits, which will be blooming ahead of the deciduous fruits. For mature peach trees up to 4 lb. of sulphate of ammonia, or its equivalent in some other form of nitrogen, per tree, will be necessary if vigorous growth and production are to be maintained. On more fertile soils this amount can be reduced somewhat, providing the grower carefully watches the trees' vigour. On light soil types about 5 lb. of a complete fertilizer of the 2.2.1 type can be used with advantage. The increase in the cost of nitrogenous fertilizers can be somewhat offset by the more regular use of leguminous cover-crops in the orchard. Consideration of this aspect may become necessary on poor soils. Where difficulty has been experienced in the past in establishing green manure crops, growers should use every endeavour to secure some form of farmyard manure to supplement the spring application of artificial fertilizers.

Cherries, peaches, plums, apricots, and almonds may be grafted this month, as soon as growth has continued long enough to allow the bark to be separated easily from the wood of the stock. The scions, of course, must have been obtained in the winter and kept dormant by storing in a cold place. For sealing these grafts Colgraft and Mastic H will be found more convenient than the mixture of Colas and starch formerly employed for this purpose. Attention to disbudding, tying of growths from scions, and resealing will be future operations to bear in mind, and these practices always repay the time spent on them.

Citrus harvesting will be continued throughout this month. Washington Navel oranges, particularly, as their maturity increases, become more susceptible to mould development, and therefore very careful handling and the maintenance of hygienic conditions in the orchard and packing house are necessary. Picking bags, lug or sweat boxes, and graders should be kept as clean as possible. When packing, care should be observed to prevent excessive abrasion against the rough sides of the cases and squeezing and cutting in the

lidding operation. Dressed timber on the inside of the case and careful handling of the lidding press will assist in reducing mould incidence in the fruit when it reaches market. Do not allow mouldy oranges to remain in the packing house.

It is likely that a more vigorous campaign for the reworking of many undesirable varieties of apples and pears will become necessary, and growers are advised to collect scions of the popular varieties while the trees are still dormant.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

DURING the winter months, keep the ground well stirred around the annuals. The perennials should be taken up, divided, and the required amount of good vigorous healthy crowns replanted. When dividing up the delphinium crowns, reject those parts showing decay and replant only sound portions which have strong buds. Delphiniums may be increased by cuttings, using the new growth and taking a heal of the old crown with it. They strike quite readily if given ordinary propagation conditions.

If it is intended to plant a lawn this spring, give the area a light forking to encourage the germination of weed seeds. Gradually work up the area, so that it will be in good condition for planting about the end of August if fine grasses are to be sown. If buffalo or couch is going to be planted, the planting would not take place until November.

August is a good month in which to plant deciduous plants. Some deciduous climbers have very beautiful foliage in the autumn, and in addition, may produce very attractive flowers. Of the flowering deciduous climbers, perhaps the tecomas are the best known. The majority of these are vigorous growers, but they are frost tender to a certain extent. They require to be planted in a warm position and they will withstand dry conditions very well. All tecomas have trumpet-shaped flowers which are produced in clusters. *Tecoma grandiflora,* which is one of the best types, has large orange flowers which are produced in summer and autumn. *Tecoma Guilfoylei* and *Tecoma Madam Galeni* have deep crimson flowers, but otherwise are similar to grandiflora. These particular deciduous climbers must be cut back hard after the frosts have passed.

The beautiful ornamental vine, *Vitis alicante Bouchet,* is a rampant grower, and should be cut back hard each winter. It then produces long canes which trail gracefully. It will grow in almost any position, but to obtain the bright scarlet colour it requires to be grown where it gets a good deal of sun.

Wistaria is a popular climber. To encourage prolific flowering, the long runners should be checked in the summer. There are two varieties, both of which are popular as climbers. *Wistaria multijuga* has very long racemes of purple, pink, or white flowers, while *Wistaria chinensis* has not quite such large bunches of double lavender flowers. Both are very beautiful. The Honeysuckles are known by most gardeners, and the one named Hildebrandiana is probably the most attractive, with its very long tubular flowers of an orange yellow colour. This is not deciduous.

The Clematis is another popular deciduous climber, but for satisfactory growth it should be planted in a cool place, so that the area around the roots does not get dry. *Clematis montana* is one of the hardy types, producing innumerable small flowers of a pinkish colour. The Jackmanni hybrids produce large flowers of various colours. They require cool conditions for the roots, but the flowering portion must be allowed to get up to the sunlight. Planting in a bush house and allowing the growth to penetrate to the sunny side is a very suitable practice.

The Virginia creeper is very suitable for covering fences or sheds and such like. The variety, Veitchii, attaches itself to the support, and in the autumn produces very attractive autumn tints. Solandra produces large trumpet-shaped orange flowers which are very attractive, but the growth is not dense enough to cover up a fence. It is frost tender and must be cut back in the early spring.

Mandevillea is a strong grower, in a shady position. It produces pure white, sweetly perfumed flowers. Passion fruit and loganberries are often grown to hide a back fence, and at the same time the fruit is very useful for culinary purposes. In addition to these deciduous creepers, there are many evergreen ones, and a selection from these could be made to suit most conditions.

Vegetables.

Keep the growing vegetables well hoed, and commence to work down the other beds ready for the spring plantings. Make a final sowing of broad beans, and keep a sharp look out for aphis on those reaching the flowering stage. Sow seeds of lettuce and cabbage, and transplant them as required. Make a sowing of Greenfeast or Greatpod culinary peas and, when planting them, do not place the manure in the rows with the peas. If there is sufficient room, try a small row of the sugar or edible podded pea. It is used in a similar manner to the French bean, and care should be taken not to allow it to mature too much before picking or the pod will become too stringy.

Tomatoes are very frost tender, and cannot be planted outside until all fear of frost has passed. To obtain well-established plants early in the season, it is essential to sow the seeds under glass in August. In September prick them out into boxes and they will be ready to plant out in October. If the seed is planted outside in October the season would be practically over before they ripen. This would be satisfactory only if green tomatoes were required for pickling and such purposes.

There are a number of good varieties from which to select, and it should be remembered that some districts suit certain varieties much better than others, e.g., Orange Prolific gives good results in southern Victoria, but it is not satisfactory in the northern districts. Bonny Best is a good shape, and does well in the Bacchus Marsh district, but is not recommended as a variety for other areas.

The tomato takes about five months from the time of sowing the seed until the fruit is sufficiently matured to commence picking for table purposes. Market King, Kondine Red, Eccles Surprise, and Recruit are four of the popular dessert types, and San Marzano is a very good sauce variety. Further information in connexion with the cultivation of tomatoes may be obtained from the Department of Agriculture.

Tomatoes Recommended for the Home Garden

By B. P. Krone, Fruit Packing Instructor

Chinese Types.—Often crinkled, heavy croppers, do not require staking or pruning.

Early.	*Mid-season and Late.*
Sth. Australian Dwarf or Burwood Wonder	Mortgage Lifter
Pale Leaf	Bendigo Large Red
Rouge de Marmande	Sommers Long Keeper
	Orange Prolific

NOTE:—All Chinese types, with the exception of Orange Prolific, are more or less early. In other words, they require fewer days to reach maturity. In the southern parts of the State they should be grown as mid-season or late varieties for best results.

Globe or Canning Types.—Staking and pruning optional, smooth and larger than the dessert or cluster types.

Early.	*Late.*
Sunnybrook Earlianer	Red Marhio
Early Winner	Eccles Surprise
Crimson Bell	

NOTE:—Break O'Day should replace Red Marhio in Gippsland.

Dessert or Cluster Types.—Smooth, round, and usually small. Staking, pruning, and heavy feeding necessary.

Early.	*Late.*
Potentate	Sensation
Salad's Special	Salad's Special
City of Parramatta	Walker's Recruit

NOTE:—All these varieties will give better results if treated as mid-season or late varieties, preferably southern Victoria.

Special Purpose.—San Marzano (sauce and chutney).

CODLING MOTH AND BLACK SPOT—*Continued from page 387.*

The success of the system obviously depends on whether the growers receive this information quickly or not. If a sudden burst of warm weather should occur, and with it a rise in the lure catches, numerous eggs will be laid during this period. Few orchardists can completely spray their orchard in less than a week, and in the warmer districts eggs may hatch out in this time. It is necessary, therefore, to commence spraying as soon as advice is received in order that a cover can be obtained before eggs commence hatching.

There are many growers who cannot spray in four to five days because of lack of equipment. Although, in the present circumstances, growers hesitate to increase their capital expenditure, the success which has attended the installation of stationary spraying equipment on several properties in the Goulburn Valley and metropolitan districts is ample proof of the value of covering the whole of the orchard at the correct time. Such equipment is also of value in applying black spot protective sprays at the correct stage of bud development, particularly when wet weather makes orchards impassable to wheeled vehicles.

The variations in codling moth activity which occur between districts, and even within districts, call for as many centres of information as can be conveniently dealt with. Therefore, the number of properties on which lure pots were situated was considerably increased during the past season. In the Harcourt district, for instance, lure pots were located on twelve properties, and in all other districts there were four to six sets of lures which were under the care of the orchard supervisors. The value of this expansion was twofold. Firstly, more accurate data were available to the supervisor on which to base his advice. Secondly, each plot is regarded as a centre from which surrounding growers should obtain their information by personal contact either with the owner or the supervisor.

In each district, all facilities are made use of for contacting growers. The most direct and useful method is by means of circulars, which are distributed to every grower. This method has been used in a number of districts with considerable success. The Goulburn Valley is well served in this regard. The Shepparton Fruit Growers' Advisory Committee, through the Shepparton Fruit Preserving Company, sends a circular to every grower in this district. The canneries at Ardmona and Kyabram forward notices to all suppliers on receipt of advice from the supervisor. On the Mornington Peninsula, the supervisor, in co-operation with the Tyabb Co-operative Cool Stores and Trading Co., the Peninsula Co-operative Fruit Growers' Association, and the Red Hill Fruit Growers' Association, arranged for circulars to be distributed to growers in that district. The Southern Victoria Pear Packing Co., when advised by the local supervisors, distributes circulars to members in the Doncaster, Croydon, and Burwood areas. The readiness with which these organizations co-operate in this valuable service is much appreciated both by growers and by the Department. In the Rochester, Quantong, Pomonal, and Amphitheatre districts the local supervisors personally issue circulars to every grower.

Lure charts, posted up on notice boards at strategic points in each district, provide an interesting source of information. These are visited regularly each week by the supervisor, who indicates the moth catch for the week and records any advice in connexion with spraying times. Notices in the local newspapers form another useful means of contacting growers. This method is used in the Bendigo, Harcourt, and Geelong districts.

During the season, advice was broadcast from central and local wireless stations. The most effective use of this method was made in the Goulburn Valley and Bamawm districts, where the three supervisors in these areas kept in close contact throughout the season in regard to moth activity, and arranged for advice to be announced over Station 3SR (Shepparton). In the Geelong and Mornington Peninsula districts advice was broadcast from 3GL (Geelong). Information compiled from all districts was used during the "Man on the Land" session from 3UZ on Tuesday and Friday. In addition to the services mentioned above, the Department co-operated with local fruit growers' associations in arranging field days and evening lectures.

Recommendations.

Codling Moth.

The conditions prevailing in the industry last season had an adverse effect on pest control which, in a number of instances, was relegated to a position of minor importance. A warning at this stage would not be untimely. Both

Inspection of trees on demonstration plot during a field day.

black spot and codling moth are troubles which, although they may not be eradicated completely, can at least be controlled to such an extent that the damage they cause is no longer a severe economic loss. This control can be brought about over a number of years only by the thorough and intelligent use of best-known methods. If a general slackening should occur, there will be a gradual build-up of both these troubles—a trend which, unfortunately, began to show up last season. Should this continue, it will not be long before growers throughout the State will be faced with another problem of a most serious nature, and, when conditions become normal once again, the task of reducing the incidence of these troubles will be ever so much more difficult. It is very desirable, in the interests of the industry as a whole, that growers should continue to strive after clean fruit.

An outline has been given of the system operated by the Department to assist growers in the control of codling moth. The advice given by the supervisors regarding the timing of sprays is important, but it must be combined with thorough methods on the part of the grower. Trees must be sprayed with a sufficient quantity of material to ensure that fruit and foliage are completely covered. Where a heavy crop of fruit has set, it is necessary to thin the bunches; otherwise it is impossible to obtain a coverage at the stalk end, and it is here that entries of codling moth are likely to occur late in the season.

The practice of bandaging trees is widely adopted as a secondary control measure. Bag bandages are recommended for use on pear trees because, if chemical bands are used, the rough nature of the butts enables larvae to pupate out of contact with the toxic chemical. Chemical bands may be used with success on apple trees, provided all alternative cover, such as loose bark, is removed by regularly scraping the butts and limbs and filling all cracks. It must be remembered that bag bandages cannot be left longer than ten to twelve days without inspection; otherwise the pupae will have time to hatch. Bands should be attached to trees by the end of November except in the Goulburn Valley, where they should be in position a fortnight earlier.

Spray Schedules.

It is recognized that the suitability of spray schedules varies with different conditions, and the following recommendations will serve as a useful guide for the various districts.

Goulburn Valley.—Schedule "A" should be satisfactory in this district, provided that the sprays are well timed and a sufficient gallonage of spray material is given per tree. A thorough calyx spray is most important for pears. On some of the taller trees this spray can be effectively applied only if long rods are used. Growers would be well advised to examine the calyces after spraying to make sure that the pears higher up in the trees receive adequate protection.

Schedules "C" and "D" are useful in this district, where codling moth control presents a problem, but no recommendation can yet be made for their adoption as a general practice.

Provided attention is given to bandaging the trees and to other phases of orchard hygiene, little difficulty should be experienced in control.

Bendigo, Harcourt, Quantong, Pomonal, and Amphitheatre.—In these districts, schedule "C" can be recommended to give the most effective control on all varieties of apples and pears except the Cleopatra apple. For this variety white oil cannot be recommended unless previous experience indicates that such a schedule may be used without danger of oil injury. In these districts six to nine sprays for apples and four to six for pears are usually required.

White oil emulsion used for codling moth sprays also has a controlling effect on two other pests, San José scale and red spider, and, where consistently used, the normal winter

Apple blossom buds showing "green tip" stage. The bud scales have separated from the majority of the fruit buds and the tips of the green folded leaves are just visible.

spraying for these pests has become unnecessary. Where Bordeaux mixture is used for the black spot sprays, an application of white oil in combination with Bordeaux mixture at the "green tip" stage will assist in the control of red spider.

Bag bandages are recommended, because magpies and other birds tear off chemical bandages while searching for larvae.

Metropolitan, Mornington Peninsula, and Geelong.—Either schedule "A" or schedule "B" may be used in these districts. Where difficulty is experienced in control, schedule "C" can definitely be recommended. An advantage obtained by the use of schedule "B" is that fruit can be produced with a residue which is below the allowed tolerance (0.01 grains arsenic pentoxide (As_2O_5) per lb. of fruit). The necessity for washing the fruit is thus removed.

Where schedule "A" has been used and late moth activity, such as was experienced last season, occurs, control may be effectively obtained, without building up a heavy arsenical deposit, just prior to harvest, by the application of an oil spray. Such a spray may be used on pears or apples. Six to seven sprays are usually required for apples and four to five for pears in these districts.

Where black spot is troublesome in apples and lime sulphur sprays are required during the season, it must be remembered that white oil cannot safely be used until three weeks after a lime sulphur application.

Chemical or bag bandages should be applied to trees as a regular practice.

North-east (Stanley), Gippsland, Diamond Creek, Hurstbridge, and Portland.—For these districts schedule "A" will give satisfactory control. Codling moth is rarely a major problem in these cooler districts, and long periods may occur between bursts of moth activity. Nevertheless, the timing of sprays is just as important as in other districts in order that protection will be given when most needed, and sprays will not be applied unnecessarily. In these districts three to five sprays are required.

Spreaders.—Calcium caseinate spreader may be added to lead arsenate at the rate of ½ lb. to 80 gallons. This will reduce the blotchiness of the cover. Although it has been shown that this type of cover is not disadvantageous from the control point of view, it is undesirable late in the season on coloured varieties because it causes uneven colouring.

One pint of white oil emulsion added to the vat of lead arsenate has been shown to increase the efficiency of this spray by increasing its adhesive properties.

Black Spot.

In spite of the wet conditions which prevailed during the winter, black spot

Showing "early pink" stage of apple blossom.

infection on all plots was low and in some cases negligible. No modifications can be suggested in present spray programmes. The important factors in control are to recognize the correct stage of bud development for a particular spray and to spray thoroughly, particularly the tips of higher leaders.

The various stages of apple bud and fruit development at which sprays are applied are as follow:

(1) *Green-tip.*—This is recognized when the bud scales have separated from the majority of the fruit buds and the tips of the green folded leaves are just visible.

(2) *Finger.*—The young green leaves have separated from the blossom buds, which are beginning to separate in the cluster.

(3) *5 to 10 per cent. blossom,* i.e., when only this proportion of flowers has opened.

(4) *Petal fall,* i.e., when the majority of the petals have fallen.

(5) *Fourteen days after the petal fall* application.

Bordeaux mixture 6:4:40 is always applied at the green-tip stage, and is then followed by a series of lime sulphur sprays at stages 3, 4, and 5. The strengths of these sprays are respectively $2\frac{3}{4}$:100, 2:100, and $1\frac{1}{4}$:100. For varieties not susceptible to russet, such as Cleopatra, Granny Smith, Delicious, Rome Beauty, and Dunns, Bordeaux mixture 3:3:50 may be used at the finger stage. This schedule is not suitable for the Jonathan, London Pippin, Yates, Rokewood, and Gravenstein varieties.

Pear blossom showing "finger" stage.

The "delayed green tip" stage of pears.

Pears.

The various stages of growth of pears at which sprays are applied and the strengths of such sprays are as follow:—

(1) *Delayed Green-tip.*—When the maximum number of fruit buds has brown scales or bracts separating and the tips of the green folded leaves are just visible, apply Bordeaux mixture 6:4:40.

(2) *Finger.*—When the green leaves are separated from the blossom buds which are beginning to separate in the cluster, but before white petals appear, apply Bordeaux mixture 6:4:40.

(3) *Late Calyx.*—About three weeks after the fruit has formed apply Bordeaux mixture 3:3:50.

The above schedule is suitable for the Williams Bon Chretien and Beurre Bosc varieties. Only one Bordeaux mixture (6:4:40) should be applied to the Josephine, and this should be at an early green-tip stage. Any further Bordeaux sprays will russet this variety.

For Winter Nelis the application of the finger spray must be completed before any petals show pink, while the late calyx spray must not be applied within three weeks of petal fall. For clean-skinned varieties, such as Packham's, apply 1:1:50 Bordeaux mixture at the late calyx stage.

Control of Summer Spot.

If the above schedules are carefully adhered to, little trouble should be experienced from late or summer spot. If the late spot appears, 6 oz. each of bluestone and freshly-slaked lime should be included in each 100 gallons of lead arsenate or white oil spray. Where lead arsenate only is used for codling moth control, lime sulphur may be used at a strength of 1:100. If lead arsenate and lime sulphur are combined, add the lead arsenate plus ½ lb. calcium caseinate spreader to the diluted lime sulphur.

Russet.

The problem of russeting, particularly with the Jonathan variety, occurs in some districts. This cannot always be ascribed to the spray treatment, but, if care is not observed in the application of black spot sprays, damage to the fruit may result. For Jonathans, the Bordeaux mixture spray should be applied at the early green-tip stage when the buds are just breaking. Injury may also result from the use of a combination spray of lead arsenate and lime sulphur. An increase in the soluble arsenic content of the spray occurs from this combination. The inclusion of calcium caseinate spreader or lime reduces the amount of soluble arsenic, but if weather conditions are showery and the spray dries slowly some damage may still occur. Under such weather conditions it would be more advisable to apply the sprays separately.

Acknowledgments.

The willing co-operation of growers on whose properties plots have been established, and the help given by the various organizations in connexion with the advisory services, are very much appreciated by the Department.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Accredited Tubercle Free Herds.

Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	211	13	Gorman, A. W. ..	"Cathcart," Alexandra	64
2	Warragul High School	Warragul ..	48				
3	Payne, A. E. T. ..	"Yarra View," Lilydale	77	14	Samuel, B. T. ..	Lang Lang ..	60
4	Dennis, Mrs. A. A. ..	Frankston ..	19	15	Powell, T. S. ..	"Carellen," Mansfield	41
5	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	87	16	Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	16
6	School of Horticulture	Burnley ..	6				
7	Lawrence, P. H. ..	"Rainga," Tarrawarra	60				
8	Banyule Stud Pty. Ltd.	Heidelberg ..	63	17	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	27
9	Black, Miss Grace ..	Mount Noorat	35				
10	Black, Estate, Late I. S.	"The Cottage," Mount Noorat	46				
11	Read, John D. ..	"Springhurst Estate," Springhurst	112	18	Onley, W. H. ..	"Glenholme," Caldermeade	52
				19	Payne, T. E. N. ..	"Woodburn," Kilmore	57
12	Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17	20	Holloway, R. W. ..	Caldermeade	54
				21	Dookie Agricultural College	Dookie ..	81

The Meadow Nematode

By C. R. Millikan, M.Agr.Sc., Plant Pathologist

The meadow nematode, *Pratylenchus pratensis* (*De Man*) *Filipjev* 1936, was recorded for the first time for Victoria during 1939. It was found attacking the roots of cereals grown on black soil in the Wimmera district.

This nematode has undoubtedly been present in the Wimmera black soils for a considerable time, its presence being overlooked by the fact that it occurs in this instance in close association with another eelworm which attacks cereals (*Heterodera schachtii Schmidt*), the larval stages of which it superficially resembles, although there are anatomical features which distinguish the two types of worms.

Unlike the latter (*H. Schachtii*), in which the females become swollen and sac-like, the adults of both sexes of the meadow nematode remain elongate and worm like. As a result, the worm at all stages of its life cycle is scarcely visible to the naked eye, as the length of the adult is approximately 1-50th of an inch.

Fig. 2.—Adult and eggs of the meadow nematode in wheat root.

Life History.

After hatching from the egg, the meadow nematode passes through four larval stages before reaching the adult stage. It was surmised that the first stage larva was the only infective stage (2), but Hastings (3) has found that all stages of the worm are capable of entering oat roots. In contrast with the larvae of *H. schachtii*, however, which enter the tips of the young roots (7), the meadow nematodes congregate in the mature root zone, where they penetrate and feed (5).

Hastings (3) has further shown that more than one generation is passed during a year, the full life cycle taking from 54 to 65 days. It is characteristic of the nematode that adults, larvae and eggs may be found together in parasitized roots. The female lays its eggs at the rate of not more than one a day, but the total number of eggs from a single female has not been determined.

The nematodes are capable of migrating for distances up to several inches through the soil, but they do not appear to move far in the root tissue. The parasite occurs in the cells of the root cortex.

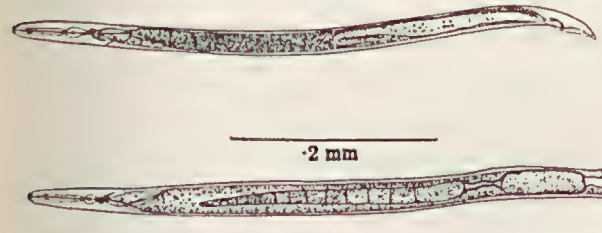


Fig. 1.—The meadow nematode—above, male; below, female.
[After *Goodey*.

Damage Caused.

The meadow nematode is practically world-wide in its distribution, and has been recorded on a wide variety of plants, including wheat, oats, barley, flax, rye, potatoes, cabbage, lettuce, peas, bamboo, fig, narcissus, apple, cherry, &c., (2). The pathogenicity of the nematode to the different host plants apparently varies very appreciably. Goffart (1) has stated that in the case of cereals, the nematodes may be present in apparently healthy roots, causing no discoloration such as occurs in other types of plants,

an observation which is in accord with the experience of the writer.

In the Victorian Wimmera, however, the position is complicated by the fact that the nematode invariably occurs in association with *H. schachtii* and root rot fungi. It is probable that the attack of the nematodes facilitates the entry of the root rot fungi. This aspect of the problem has been studied by Hastings and Bosher (4), who found that when freed from associated fungi, the meadow nematode reduced the growth of potato, carrot, red clover, spinach, and violet seedlings by 50 to 75 per cent., and oat seedlings by less than 4 per cent. It is apparent, therefore, that the damage caused directly by the nematode to cereals is relatively slight.

Control Measures.

No specific measures to prevent the attack of the meadow nematode on cereals can be recommended. The measures advised are, therefore, aimed at promoting the general vigour and rooting capacity of the plants to enable them to better withstand the attacks of the worm and associated organisms.

Rotation.

It is not known how long the meadow nematode is capable of remaining in a viable condition in the soil, but it is probably too long to enable a practical rotational system for its elimination to be devised. The problem of host plants, other than cereals, which it attacks is also important in this regard.

The rotation wheat, oats, fallow commonly practised in the Wimmera district is probably the most suitable one, particularly if an oat variety such as Mulga, Guyra or Gidgee, which is resistant to *H. schachtii* (7), is included. The fallow should also be kept quite free from weeds which would be possible hosts for the nematodes. The addition of field peas to the rotation may be practicable in some instances. This practice has been found to have a very beneficial effect on the yield of subsequent wheat crops, by increasing rooting capacity and reducing infestation with *H. schachtii* and root rot fungi.

Mineral Treatment.

The rooting capacity, growth and yield of wheat grown on Wimmera black fallow soil infested with the nematode root rot fungi complex has been found to be very appreciably improved by the application of 10 to 15 lb. of zinc sulphate per acre, in conjuncton with the usual dressing of superphosphate (6).

Experiments are in progress with a view to further improving the growth of cereals on infested areas.

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Pregnancy Toxaemia of Sheep

(*Continued from page* 402.)

aggravate the other. Wormy ewes would be liable to develop lamb-sickness, because of the drain on the system; and ewes heavy in lamb would suffer more from worm infestation than dry ewes.

Toxaemic jaundice, or yellow disease, may also be confused with pregnancy toxaemia, the former, of course, occurring in dry ewes and wethers as well as in pregnant ewes. Affected animals usually mope about for a few days before going down, but, although sick, they usually are stronger on their legs than in the case of lamb-sickness. On post-mortem, the liver is seen to be a much brighter yellow than in lamb-sickness, and the skin, carcass fat, and abdominal fat show a distinct yellowness.

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—September, 1940.

WAR TIME AGRICULTURAL POLICY

Statement by the Minister of Agriculture, the Hon. E. J. Hogan, M.L.A.

CAREFUL consideration to the question of war time agricultural policy in Australia was given by a recent meeting of the Agricultural Council in Sydney according to a statement issued by the Minister of Agriculture, the Hon. E. J. Hogan. The United Kingdom Government, Mr. Hogan pointed out, had indicated that it desired increased supplies of dairy produce—butter, cheese, dried and condensed milk, &c., and eggs, and, subject to further confirmation, pig meats.

There was no indication of any immediate increased demand for wool, dried fruits, barley, rice, lard or tallow. The United Kingdom Government had also indicated that wine, canned fruits, and fresh fruits had so low an order of priority for shipping space that their export in normal quantities was unlikely. Mr. Hogan said that the United Kingdom Government's wishes in regard to the Australian supply of beef, mutton, and lamb had not been finally determined, but there were indications that for the time being increased supplies of these commodities were not desired.

Contracts for the purchase by the United Kingdom Government during the forthcoming year from Australia of butter, cheese, and eggs had already been concluded and they provided for slight increases on the amounts which the United Kingdom Government contracted to purchase last year. The capacity of the United Kingdom Government to take quantities in excess of those contracted for depended on the continued availability of shipping and port facilities in the United Kingdom.

Mr. Hogan added that supplies of butter, cheese, and eggs from Denmark were no longer available to the United Kingdom, and there was the opportunity for producers in this country to assist in making up the deficiency in the United Kingdom's import requirements formerly supplied by Denmark. That country, by reason of the enemy occupation and losses of stock arising therefrom, might be unable for many years to regain her previous position as a supplier of dairy produce to the London market.

The United Kingdom was utilizing dried milk as a means of increasing the nutritive value of bread and for this purpose needed substantially increased imports of that commodity. The East formerly purchased large supplies of condensed and dried milk from Holland. This source of supply was no longer available and the opportunity existed for enterprising Australians to secure this market.

It would be wise, in view of the possibility of a shortage of refrigerated space, for an increased proportion of the milk produced in Australia to be manufactured into cheese. Less exacting refrigeration facilities were required for cheese, and these could be readily improvised.

The conversion of increased supplies of milk into condensed milk and cheese would reduce the number of pigs which could be raised on Victorian dairy farms, but the Agricultural Council was of the opinion that, to the extent practicable, an increased number of pigs could be raised in the wheat belt. This would assist

wheat growers to economically use their surplus grain, but increased supplies of meat meal or other protein-rich foods would be required. The Council was also of the opinion that the production of eggs should be stimulated in the wheat belt for the same reason.

Consideration was also given to the possibility of raising in the Commonwealth a number of commodities formerly imported. Tobacco was one of these, and it was decided to increase the production of tobacco in Australia; Victorian growers in suitable localities would be urged to increase their production of tobacco.

Steps had already been taken to increase the supplies of flax in order to provide for the Australian requirements of raw material necessary for the manufacture of seaming twines and sewing twines generally, and, to the extent that the United Kingdom Government could supply seed, the flax urgently needed by that Government. Efforts were being made to ascertain from the United Kingdom Government her requirements of flax for next year in order that growers might be informed in time to enable them to prepare the land adequately.

The Minister said that supplies of vegetable and pasture seeds formerly imported into the United Kingdom and into Australia from foreign countries were no longer available and an opportunity existed for growers here to expand those industries.

In a world struggle of the present intensity it was clear that there would be far-reaching disturbance of the economy of nations, and it was impossible to look far ahead into the future. The changes in production that had been suggested were made after careful consideration of such information as was in the possession of the Commonwealth Government, and they were issued for the guidance of producers who would realize that in times such as these changes in long established practices were inevitable.

Imported Pasture, Fodder, and Vegetable Seeds

HITHERTO considerable quantities of pasture, fodder, and garden seeds have been imported from overseas into Australia. Supplies are no longer available from countries overrun by the enemy, and, according to a statement made by Mr. R. B. Tennant, Director of Primary Production in New Zealand, to the Director of Agriculture (Mr. H. A. Mullett), Australia will not be able to replace these seeds from New Zealand or, indeed, to obtain normal supplies of those seeds usually imported from New Zealand, owing to the efforts of that country to meet requests from the British Government.

Mr. Mullett said that a preliminary survey of seed stocks in Melbourne had indicated that the production of increased quantities of cocksfoot seed should be given immediate attention by Victorian growers. Normally, some 40 tons per annum of cocksfoot seed were imported into Victoria from Denmark and New Zealand. To replace this quantity, the produce of approximately 1,000 acres of cocksfoot pastures would be required. To ensure productive yields of cocksfoot seed it was necessary to remove stock from paddocks intended for seed production before the flowering shoot appeared. The Departmental Agrostologists advise that the seed producing shoots begin to make their appearance in most cocksfoot fields during early spring; therefore intending growers of cocksfoot should take early steps to protect the fields from grazing animals.

In view of the likelihood of a shortage, Mr. Mullett said that seed merchants would be well advised to make early contracts for seed with growers.

Intending growers who require any further information are advised to get in touch with the Department of Agriculture, Melbourne, C.2.

The champion herd test cow for 1939-40. Mr. G. A. Fraser's "Glengowrie Ray"—783 lb. butter-fat. (She has averaged 706 lb. for the past four yields).

Standard Herd Test, 1939-40

Record Average Yield

By W. J. Yuill, Supervisor of Herd Testing

DURING the early months of 1939, the dairying districts of this State were favored with splendid rains which brought about an extraordinary growth of summer crops and pastures. As a result, cows which calved during the following autumn began the 1939-40 test under spring-like conditions, which continued throughout the greater part of their test period of 273 days. The spring-calving cows, however, were not so fortunate, and were somewhat at a disadvantage, owing to the dry conditions associated with the long hot period of the past summer. However, it is doubtful if any dairying season ever began and continued under more favorable conditions. This is reflected in the record level of dairy production reached in Victoria during the past year. In these circumstances, it is not surprising that a new record average yield for all cows under test was established.

During the year, 1,644 cows of all ages averaged 360 lb. butter-fat—a yield that is 3 lb. above the record made by 2,861 cows in the 1932-33 season. Many excellent performances by herds and individual cows were recorded throughout the State.

Since the beginning of the year under review, there has been a steady increase in applications

Some members of Mr. R. M. Chirnside's "Mornmoot" Jersey stud which has the honour of being champion herd for the sixth year in succession.

for entry into the Standard Herd Test. A pleasing feature of these entries is the increase in the size of the herds which, generally speaking, are far too small. Small herd size is a contributing factor to the high cost of the Standard Herd Test. The main reason for this increased number of entries perhaps is the effect of the legislation contained in the new Cattle Breeding Act which, in 1945, will require all dairy farmers to use a herd-sire from a tested dam of a prescribed minimum yield. In addition, the scarcity of herd-testers, which has caused a number of Herd Test Associations to close down, has brought about the transfer of some breeders to the Standard Test.

"Rose Gem of Maple Lodge" (Imp.)—Captain A. E. T. Payne's mature Guernsey which was highest producer for the year. (856 lb. butter-fat.)

The Champion Herd.

For the sixth consecutive year the distinction of being the champion test herd goes to Mr. R. M. Chirnside's "Mornmoot" Jersey stud. On this occasion, his herd of 29 has the excellent average yield of 481 lb. butter-fat—a figure that is increased to 553 lb. when all allowances for junior cows have been added.

Mr. F. Austin's "Avalon" Jersey stud, consisting of eighteen members, occupies the reserve position with 469 lb. butter-fat (535 lb. with allowances). In third place is Captain A. E. T. Payne's herd of 33 "Yarraview" Guernseys with a record of 527 lb. butter-fat (including allowances). This excellent yield can be appreciated better when it is remembered that high average yields are increasingly more difficult to obtain as the herd number increases.

Including allowances for junior cows, the fifteen Friesians of the Salesian College, Sunbury, have the excellent yield of 511 lb. butter-fat, which indicates the capacity of this famous dairy-breed under good conditions. Messrs. T. M. Noble and Sons' 24 "Finchley" Jerseys, and Mr. T. S. Powell's Jersey herd of sixteen, each exceeded the 450-lb. level of butter-fat (500 lb. with allowances). Among the smaller herds, Mr. J. H. Goddard's Ayrshires also exceeded the 500-lb. level; as did

also the Jersey herds of Messrs. F. A. Williams, N. H. Enders, P. J. Maloney, R. H. Mitchell, and R. G. Gay and Son.

In all, seventeen herds exceeded the 400-lb. level of actual butter-fat. Among these are some large herds with fine performances, including Messrs. G. A. McNabb and Son's 44 "Maxon" Jerseys (413 lb. butter-fat); and Mr. W. K. Atkinson's 71 "Willow Park" Dairy Shorthorns (339 lb.). Another noteworthy yield was the 334 lb. average of the 54 Red Polls at the Werribee Research Farm.

Other good performances made by large herds under varying conditions in widely separated areas of the State include the 32 "Springhurst" Jerseys (399 lb. butter-fat); the 34 Jerseys owned by Mr. E. Hore, of Leitchville (384 lb.); and the 39 Jerseys of the "Sylvan Hills" stud (351 lb. butter-fat). It should never be overlooked that the real significance of each herd's performance can be fully appreciated only when all factors of environment, rainfall, herd size, and management are known.

Mr. J. H. Goddard's reserve champion Ayrshire—"Donside Lydo Lady"—748 lb. butter-fat (average 628 lb. for the last four seasons).

Champion Cow.

For the first time in the history of the Standard Herd Test, both the champion and reserve champion positions are held by two members of the Ayrshire breed. The new champion test cow is Mr. G. A. Fraser's Ayrshire "Glengowrie Ray"; while the reserve

Mr. F. Austin's "Avalon" Jersey herd gained the reserve championship. The eighteen members of this herd averaged 469 lb. butter-fat.

The leading senior two-year-old—"Inverurie Bluebell" (602 lb. butter-fat)—owned by Mr. J. H. Goddard.

position is filled by Mr. J. H. Goddard's beautiful Ayrshire "Donside Lydo Lady." On one other occasion only has an Ayrshire been champion test cow. This was in 1925 when "Poppy of Ben Kell" yielded 692 lb. butter-fat

The highest producer for the year was Captain A. E. T. Payne's mature Guernsey "Rose Gem of Maple Lodge" (Imp.). Her yield of 856 lb. butter-fat constitutes a new high level in this State for the Guernsey breed. This performance is marred somewhat by her long periods between calvings. Because of this, she was not eligible for the championship. There were several other high producers for the year. Of the 138 cows which exceeded 500 lb. butter-fat, 30 produced over 600 lb. and five of these passed the 700 lb. mark.

"Glengowrie Ray" began her test career at two years and one month, her initial record being 7,155 lb. of 4.15 per cent. milk, and 297 lb. butter-fat. This yield was followed by one of 401 lb. At this stage, there occurred a remarkable increase in the average test of her milk. This high average test has been maintained during the past four lactations, and is shown in the table below:—

Class.	Milk. lb.	Average Test %	Butter-fat. lb.	Last Day's Milk. lb.
Senior 4 ..	13,104	5·06	663	32½
Mature ..	14,895	5·33	794	31
„	12,794	5·29	677	28
„	15,430	5·08	783	15½

Unlike many cows of the Ayrshire breed, "Glengowrie Ray" usually finishes each year with a milk yield of more than 3 gallons. In each of the first four sub-periods of her champion performance, she exceeded 100 lb. butter-fat, her best effort being 122 lb. during November. She is an unusual cow in many respects. She is a great feeder, and does not mind a change of feeding, or of milker. She will feed anywhere, and has a real "dairy cow's" disposition.

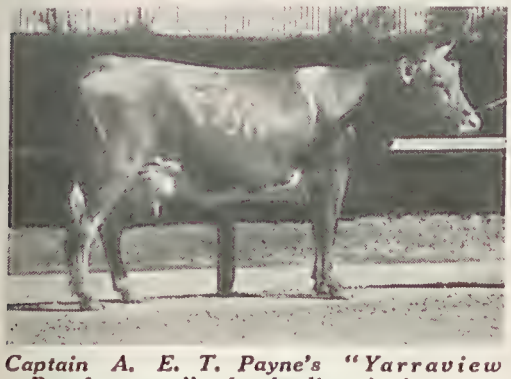
Although "Ray" is not the type that appeals to the show-ring judge, she has many outstanding features of a really great dairy cow.

A high producing family owned by Messrs. G. A. McNabb & Son. Top—"Boorine Silver Light" (Mother)—9 years average 444 lb. butter-fat; Centre—"Maxon Countess Light" (daughter)—735 lb. butter-fat as a mature cow; Bottom—"M. Chieftain's Light" (grand-daughter) 526 lb. butter-fat as a junior four.

Showing the splendidly developed "middles", rumps and udders of some members of Mr. F. Austin's "Avalon" herd. This group contains two "Starbrights" and four "Madeiras"

Among these is the unusual width of pinbones, and her splendidly balanced and capacious udder, which, despite the production of more than 32 tons of milk while on test, looks more like that of a young cow, than a matron with seven test records to her credit. Twice previously "Ray" has been in the running for a championship place, but failed to calve within the stipulated period. On this occasion, however, she will re-calve in a little over twelve months, and thoroughly deserves the distinction she has earned for herself, her owner, and the breed.

The reserve champion position goes to Mr. J. H. Goddard's "Donside Lydo Lady," a beautiful specimen of her breed, with numerous championships in Ayrshire and dairy-cow classes to her credit. During the past four years she has averaged 628 lb. of butter-fat—a production attainment figure—which places her at the head of the breed in the Advanced Register. Her yield of 748 lb. made during the past season, was influenced by thrice-a-day milking for about half of the test period. That she is a real champion, is shown by her progeny's influence in the herd. Her son, "Inverurie Laddie," is the sire of several fine producers, including "Inverurie Bluebell," whose 602 lb. senior two-year-old yield is a Victorian record at this age for the breed.



Captain A. E. T. Payne's "Yarraview Benefactoress"—the leading junior two-year-old. (521 lb. butter-fat).

In "Maxon Countess Light" (735 lb. butter-fat) we have a representative of a very large Jersey herd (Messrs. G. A. McNabb and Son) that has been under test continuously for a great many years. "Countess Light" is one of the many high-testing daughters of "Maxon Count Graceful," a bull that made a decided improvement on the "Maxon" herd. Seven daughters of this bull appear in the Advanced Register.

Mr. R. H. Mitchell's "Clifford Farm" stud is situated at Linton, and his cows have no natural advantages to assist them in making high yields. Because of this, the 718 lb. butter-fat yield of his "Clifford Farm Gladsome" is a really meritorious performance.

Mr. R. M. Chirnside's "Mornmoot Fancy Starbright" (705 lb. butter-fat) has a five-year average yield of 585 lb., and appears in the Advanced Register, with a production attainment of 678 lb. age-corrected yield, for her best four years. Her sire, "Werribee Prince Madeira," has several excellent daughters in the Advanced Register.

Space does not permit of a detailed account of each of the great producers that appears among the nineteen individuals with yields between 600 and 700 lb. butter-fat; or of the excellent performances by a large number of cows that have topped the 500 lb. butter-fat level during the past season and, in some cases, over a number of years in succession.

[*Continued on page 442.*

Manuring Peach Trees for Profit

By C. E. Cole, B.Agr.Sc., Horticultural Research Officer

THE peach tree is one of the most "temperamental" of fruit trees. Though most parts of Victoria are suited to its growth, its varieties are not really adapted to a wide range of climate. It likes plenty of moisture in summer, but it cannot stand wet feet. It likes a good soil, but probably prefers a sandy type even if low in plant foods by analysis. Too rich a soil may reduce fruit quality. It can easily be overpruned and it can easily be underpruned. It quickly succumbs to the attacks of pests. Its fruit must be picked almost to the day, and that of dessert varieties handled more carefully than eggs. Yet, when conditions suit, it is a prolific bearer, and produces a crop profitable to the grower and delectable to the consumer.

Therefore the utmost care must be taken in choosing the soil, the aspect, and the most suitable variety, and in providing perfect drainage and an adequate water supply. On these foundations must be built a sound superstructure of cultivation and green crops, of good pruning, and of fruit-thinning. And all this must be protected by an adequate pest-control programme. The manuring or fertilizing of the trees is the repair work, i.e., the replacement in the soil of plant-foods that are required in large quantities to build its framework of roots, trunk, and branches, and are taken away in the fruit, blown away in the leaves, carted off in the prunings, and leached away by rain and irrigation water. Without manuring, the tree will stagnate, fall into disrepair, and become unprofitable; with it the tree will remain vigorous and productive. It is the extra ounce in the scales which will tip them to the profit side.

There is little doubt that animal manures hold pride of place as builders of soil fertility, and are particularly valuable in the peach orchard. Regular moderate applications of stable, poultry, or sheep manure will maintain healthy trees and good crops. Animal manures are also a very effective adjunct to cover crops in improving soil texture, drainage, and moisture-holding capacity, and in preventing erosion from the hillsides on which dessert peaches are so often grown. Most growers realize this, and, regretting the growing scarcity and costliness of these manures, seek some adequate substitute.

Adequate manuring keeps trees vigorous and productive. — Canning peaches in the Goulburn Valley.

The obvious suggestion is artificial fertilizers, which can supply the phosphates, nitrogen and potash required by the tree as readily, perhaps more readily, than can animal manures, but they cannot supply at least one very important component — humus. If artificial fertilizers are to be used, the importance of the winter cover crops as a source of humus becomes vastly increased. It may be the natural herbage encouraged by an autumn dressing of superphosphate or nitrogenous fertilizer, it may be a sown crop of oats, rye, barley, or, best of all, a legume such as field peas or tick beans.* Whichever it is, it should be made one of the prime considerations in each year's programme.

Of the three main plant-foods supplied by animal manures, nitrogen has long been con-

* See articles on Green Manuring in the March, 1939 and March, 1940 issues of this Journal.

The cropping of the peach tree depends on the plentiful production of new lateral growth.

sidered the most important in Victoria for tree growth, and the one which most frequently is not supplied by the soil in sufficient quantity at the correct time to meet the trees' demands. It is particularly important to the peach tree, whose cropping depends on the plentiful production of new lateral growth each year. The amount of nitrogen which it is economical to add to the soil each year, however, and the necessity of supplying fertilizers containing phosphate and potash in addition to the nitrogen, have always been uncertain.

Four trials to elucidate these points have been carried out in Victoria in recent years. Three have been carried out by the Department with the dessert varieties, Zerbe's No. 1, Smith's Seedling, and Wiggins, growing on the typical silurian orchard soils of the Templestowe and Doncaster districts. The Department is deeply indebted to Mr. H. R. Petty and the late Mr. Herbert Petty, of Doncaster, for making suitable blocks available, and for the great amount of painstaking work which they contributed to the trials. The fourth trial, on Pullar's Cling peach trees at Kyabram, was commenced in 1934, and is still being carried on. This trial was designed by the Department in co-operation with Mr. R. A. Boyle, M.Sc., and both he and Mr. Roper, on whose property it is situated, have assisted so extensively with the routine field work that officers of the Department have found it necessary to give only general supervision to the experiment and to carry out the statistical examination of the results.

Each of these experiments was set out in such a way that any differences due to manurial treatment could be compared with differences due to natural causes like soil variation, and their significance so tested. In the case of the trial with Smith's Seedling peaches, this natural variation was so great that no effect of fertilizer treatment could be proved, the number of replications being small, but the behaviour of the trees was obviously similar to the other trials. It is hoped to publish at a future date a more detailed account of these trials. In the present article only the results will be described to illustrate the points discussed.

Nitrogen Requirements.

In the three trials with dessert peaches, dressings of 4 lb. of 2:2:1 complete manure (containing 1.6 lb. of sulphate of ammonia) per tree were compared with dressings of 4 lb. of sulphate of ammonia per tree applied in the spring of each year. Other plots were left unfertilized for comparison. In the third year of the trial with Zerbe's No. 1, the trees of which had been fertilized fairly heavily before the trial started, the complete fertilizer plots yielded three-fifths more, and the sulphate of ammonia plots one and a quarter times more than the unfertilized plots. In the second year of the trial with Wiggins, the trees of which had been fertilized more lightly before the experiment commenced, the complete fertilizer plots yielded two-fifths more, and the sulphate of ammonia plots slightly more than half as much again as the unfertilized plots. The third year of this trial was ruined by the death of many of the trees during a very wet winter, otherwise even greater increases may have been obtained. As stated above, the yields of the Smith's Seedling trees, partly due to the same cause, were too irregular to give any significant results.

The treatments used in the experiment with canning peaches were:—

(1) 4 lb. of superphosphate per tree.

(2) 4 lb. of super. + 2 lb. of sulphate of ammonia per tree (equivalent to 6 lb. of 2 and 1 super. and ammonia).

(3) 4 lb. of super. + 4 lb. of sulphate of ammonia per tree (equivalent to 8 lb. of 1 and 1 super. and ammonia).

(4) 4 lb. of super. + 4 lb. of sulphate of ammonia + 2 lb. of sulphate of potash per tree (equivalent to 10 lb. of 2 : 2 : 1 complete manure).

Situated on a more fertile soil than those described above, the trial with canning peaches continued for five years before it was possible to prove any yield differences, although differences in appearance and growth were obvious much earlier. In the fifth year, the plots receiving 2 lb. of sulphate of ammonia per tree (in addition to 4 lb. of super.) yielded one-fifth more, the plots receiving 4 lb. of sulphate of ammonia one-third more, and the plots receiving nitrogen and potash just over one-third more than the super. only plots. The sixth year's results confirmed these increases. It will be appreciated that because canning peaches bear much more heavily than dessert peaches, the lower *percentage* increases in the former actually represent much larger *weight* increases than in the latter. The fifth season was hot and dry, the sixth was cool, and water was plentiful, so that the results were not seasonal.

In each trial, then, 1.6 or 2 lb. of sulphate of ammonia has caused the trees to yield appreciably more fruit than trees not receiving nitrogen, and 4 lb. of sulphate of ammonia has caused other trees to yield still more fruit. Both increases are obviously a handsome return on the money invested in the fertilizer.

Dessert peaches must be handled more carefully than eggs. —Packing for the metropolitan markets.

But what of the effect of nitrogen on factors other than yield? Just as important as yield is tree health. In every case, including the Smith's Seedling trial, the trees not receiving nitrogen were reduced in health very quickly. It was not necessary to measure this decline—it could be seen clearly from the first year, and it was the direct cause of the yield differences quoted above. In later years the yellow-green leaves, sparser foliage and weakening growth of the unfertilized trees contrasted sharply with the thick, blue-green foliage and vigorous growth of the nitrogen-fertilized trees. The nitrogen-fertilized trees of the Zerbe's trial produced half as much lateral growth again as the unfertilized trees. In the case of the dessert peaches the decline in the health of the unfertilized trees was so marked at the end of the third year that it became necessary to supply nitrogen to them to prevent them being permanently affected. This and other factors caused the trials to be discontinued.

The view is held by many growers that nitrogenous fertilizers result in an increased susceptibility of peaches to brown rot. In one of these trials, on Wiggins, records of infected peaches were taken year by year. In the others careful observations were made, both by the growers and by the Department's officers. Not in any year or trial was an increased percentage infection apparent in the

Healthy trees mean big crops.—Picking dessert peaches at Doncaster.

nitrogen-fertilized plots. It is true that in some cases there was an increase in the *number* of infected fruits in these plots, but only as a result of the greater number of fruits carried by the trees. Such increases, of course, were never sufficient to offset the increase in yield due to the nitrogen. However, more observation will be necessary before the above view is disproven completely.

Within the range of these experiments, nitrogenous fertilizers have had little effect on size and quality of fruit. They increased the size of the Wiggins in one instance, so that whereas the fruit from the unfertilized plots averaged $3\frac{1}{3}$ to the pound, that from the fertilized plots averaged 3 to the pound. The fruit from the fertilized plots was less highly coloured in general than that from the unfertilized plots, the colour of the latter being heightened by the greater amount of sunlight reaching the fruit through the sparser foliage of the trees.

A good cover crop is an essential adjunct to artificial fertilizers.—Tick beans at Pakenham.

Nitrogen does, however, have a definite and usually advantageous effect on the maturity of the fruit. It delays the peak of maturity from three to four days, but in addition it spreads the maturity. Unfertilized trees in the trials matured their fruit so that it was necessary to harvest the majority of it at the first picking, quite small amounts being taken from them at subsequent pickings. Nitrogen-fertilized trees matured their fruit so that it was possible to harvest it in fairly uniform amounts at each picking. In the case of dessert peaches the harvest extended over five pickings, in ten days, instead of three or four pickings, covering seven days. With canning peaches there were three pickings instead of two. This meant more uniform marketing of the former, and a greater spread in the handling of the latter. Of course, for first-early dessert peaches such a delay in maturity would not be an advantage, but for mid-season peaches the spreading of maturity is an advantage, likewise the delay in maturity for late dessert peaches.

It is therefore possible to recommend a yearly application, a fortnight before blossoming, of up to 4 lb. per tree of sulphate of ammonia, or an equivalent quantity of any other quick-acting nitrogenous fertilizer, as being both profitable and of advantage in orchard operations. It would be more correct to say that no grower of peaches, either on the silurian soils of southern Victoria, or on the loams of the Goulburn Valley, can afford to do other than supply nitrogen to his trees, whether it be as animal manure or artificial fertilizer.

It is well to issue a word of warning against the use of large applications of soluble nitrogenous fertilizers. The nutritional balance of the peach tree is readily upset by an oversupply of nitrogen, and any increases over the amount recommended should be small and gradual. Many growers have had experience of watershoots and the production of "pumpkins" on peach trees to which nitrogen has been supplied too freely. It has also become evident in the fertilizer experiments, that pruning methods may have to be modified as the trees increase in vigour in response to nitrogen applications, in order to obtain the maximum benefit from them—in short, well-fertilized trees have the appearance of being able to produce more fruit than they actually do. The trial at Kyabram has been adapted this year to investigate this point.

Superphosphate and Potash.

There is little evidence from the trials to suggest that either superphosphate or potash must be added to the soil for successful peach-growing. In the trial with Zerbe's No. 1, the yield increases were in proportion to the amounts of nitrogen applied. In the trial with Wiggins, the yield from the plots receiving 4 lb. of sulphate of ammonia was just over one half as great again as that from the unfertilized plots. The yield from the complete fertilizer plots, receiving only $1\frac{3}{5}$ lb. of sulphate of ammonia, but in addition $1\frac{3}{5}$ lb. of super. and

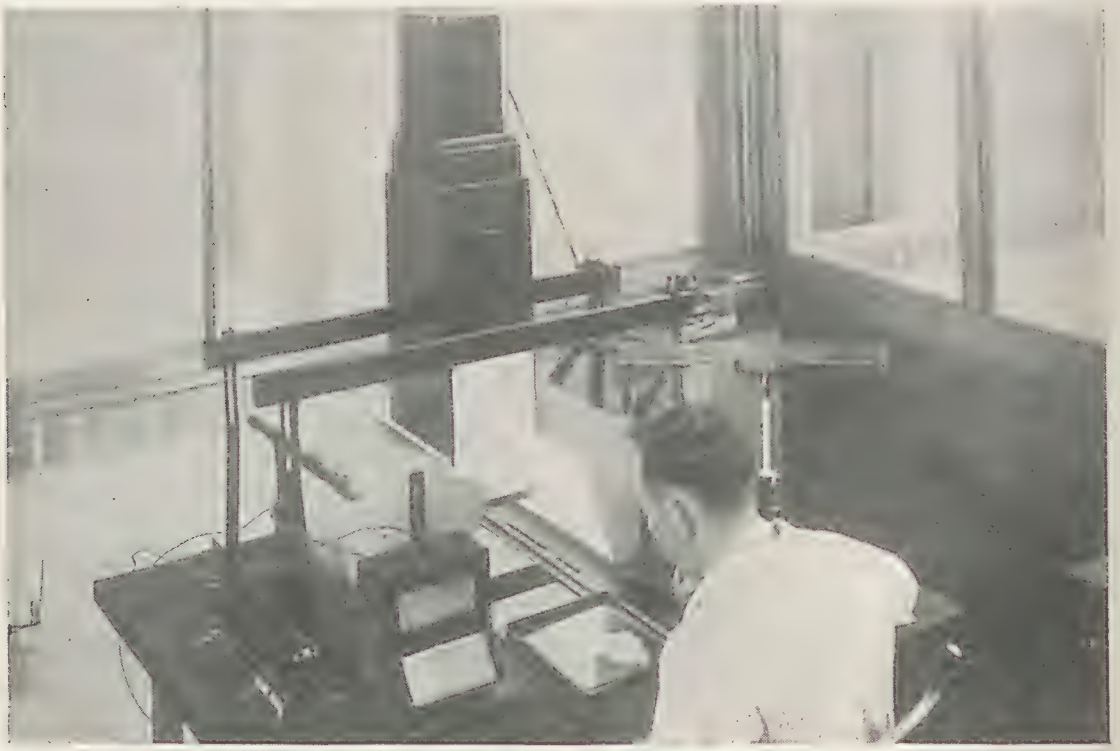
[*Continued on page 430.*

Scientific Aids to the Breeder and Pastoralist

By W. R. Lang, B.A., M.Sc., Officer-in-charge, Scientific Investigation Department, Gordon Institute of Technology, Geelong

TO expect uniformity in wool as a raw material seems at first sight to be the height of optimism, when one considers the millions of fibres composing a fleece and remembers the statement of one scientific worker, that probably "no two wool fibres are alike." Nevertheless, a relative and highly desirable uniformity can be obtained and maintained by careful and intelligent breeding. Certain breeds show greater uniformity than others; for instance, the Merino as a breed approaches the ideal more closely than does the Romney. Then again, in the same flock, certain sheep are more uniform in the fleece they produce than others. The consequence of this variability of wool upon the economics of the wool manufacturing industry lies in the necessity for highly skilled manipulation and judgment in assessing and handling the variable raw material and making an even finished product from it.

Apart from the problems of obtaining satisfactory constitution, conformation, fertility and lamb-rearing properties in his sheep, the breeder is greatly interested in the fleeces they produce. Herein his interest lies in quality and weight. The actual wool produced, considered separately from the yolk and dirt, depends on the total area of the skin producing wool; on the density of the wool, and on the mean fineness and mean length of the fibres. In order to understand the part played by each of these factors, and the possible ways of increasing all or some of them, a considerable amount of research is being undertaken, both in Australia and overseas.



The least desirable types of wool fibre are readily detected by the benzol test.

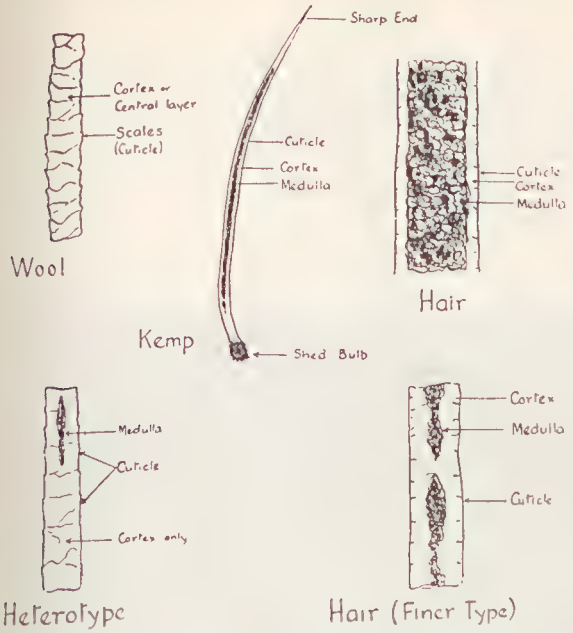


Plate 1.—The types of fibre in a fleece. Wool—a two-layered fibre. Kemp—a three-layered fibre (not continuously growing). Hair—a continuously growing three-layered fibre. Heterotype—a mixture of two and three layers in the one fibre. Hair—(finer type).

There are two ways in which lack of uniformity may occur, firstly, by the occurrence of hairy or kempy fibres in the wool, and secondly, by the irregularity of the wool itself. Scientific methods have been developed for revealing and measuring both of these factors. Thus when a breeder has culled for constitution, conformation, &c., he may then seek a still better control of his breeding by the application of the further knowledge gained from these and similar tests.

Fibres in a Fleece

The fibres in a fleece are of two distinct types, namely, those with two layers of cells and those with three. (See Plate 1.) Wool itself has two layers, an outer tough skin or cuticle, of which the serrations or scales form the surface, and an inner solid mass of spindle-shaped cells, tightly packed together and known as the cortex. The scales overlap one another, with the protruding flanges pointing away from the root. Wool as a textile fibre is transparent, very elastic, and possesses excellent dyeing properties.

The three layered fibres have an additional layer to the cuticle and cortex, known as the medulla. Hence these fibres are spoken of as medullated fibres. The medulla is a loosely packed layer, often with minute air inclusions among the cells. Unfortunately, it is much inferior to the cortex in its physical and chemical properties, and generally causes fibres to "stand up" in fabrics containing it. Such fibres are usually much thicker also. These medullated fibres are of two types, those growing continuously, and those that are shed at certain periods. Hair or gare is a continuously growing fibre, whereas kemps are shed periodically, usually annually. In addition to these, there are certain fibres which are two-layered like wool for part of their growth, and three-layered like hair for another part. These are known as heterotype fibres.

All the medullated or least desirable types of fibre are readily detected by the benzol test, and measured by an instrument known as the medullometer.

The Benzol Test.

Benzol is a liquid of similar refractive index (or light bending properties) to wool. If clean fibres of wool are placed in a black tray containing benzol, and covered with a glass plate, the wool disappears from view. Hair, kemp, and heterotype fibres are optically different from wool, and show clearly as chalky white fibres, easily identifiable. To measure the quantity of hair present, the tray containing the benzol and the sample are brought to the medullometer. Here a bright light, which shines on the sample, is reflected inside the black box, through a focussing lens, on to a photo-electric cell. The light is changed into electrical energy, which is measured by an electrical measuring instrument known as a galvanometer. By suitable calibration the instrument gives the percentage of medullated fibre in the sample.

Research has shown which are the most likely parts of the sheep to produce hair. By sampling and testing at a series of points on the fleece suggested by these results, the type of sheep, from the point of view of hair production and breeding, can be gauged. Australian experience has shown the average Merino to be comparatively hair free, but definite and significant percentages of hair are to be found in even good members of all the crossbreeds and many of the English breeds.

Uniform Fineness of Fibre.

With regard to the uniformity of the wool itself, no wool staple yet grown, of say a 64's quality, has been wholly composed of fibres of 64's fineness alone. In a really good 64's about 30 to 40 per cent. of the fibres may be 64's, with say 15 per cent. of 60's and 66's, 5 to 10 per cent. each of 58's and 70's, and a small number of representatives of other counts. The average is 64's, and the eye estimates the average effect. A poor type of 64's may contain fibres of counts ranging from 100's to 32's. It may contain only a few fibres of the extreme counts, it is true, but nevertheless, the effect on the appearance and the type is extraordinary, in that such a wool often falls into the plain or characterless type, or may even have a "doggy" appearance.

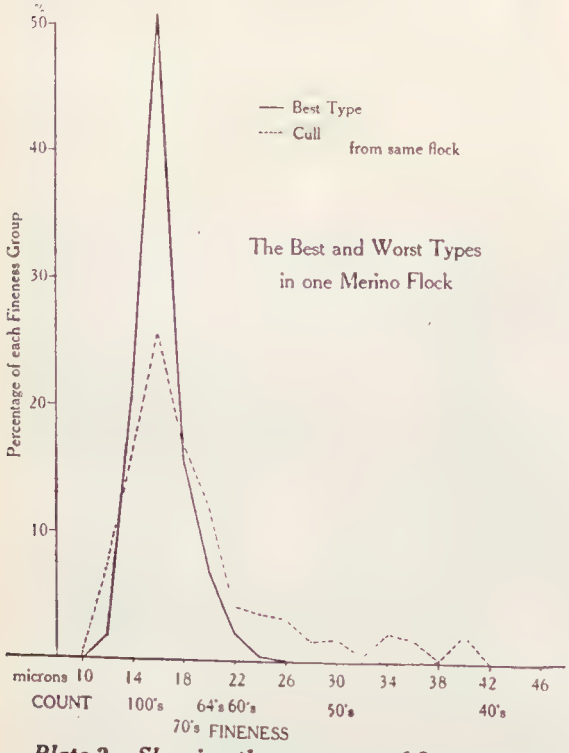


Plate 2.—Showing the extremes of fineness in one flock of merinos. The tall graph shows great uniformity in the wool of one sheep compared with the broader graph which represents a cull from the same flock. Five hundred measurements were made on each wool. (The graphs are based on the percentages of each fibre finensss group or count, occurring in the sample. A tall graph means that many fibres are alike in fineness—a broad one shows much variation.)

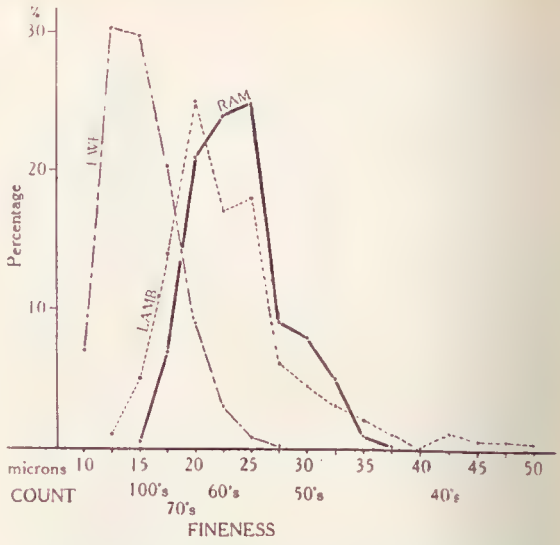


Plate 3.—Showing the fineness distribution of two extreme parents, the ram being much "stronger" than the ewe, and of their progeny which has shown greater variation than either parent.

The factors affecting fibre uniformity are mainly genetical and nutritional. Of first importance is the breeding, because if the animal cannot show an inherent tendency to uniformity, then no subtleties of feeding will ever produce it. On the other hand, a good animal given irregular or unusual feeding may not be able to keep up to the highest uniformity which its breeding gives it the capacity to do.

The determination of uniformity of fibre fineness is a laboratory measurement, and not a layman's job. In some methods the whole fleece may be considered, being broken up and thoroughly mixed until when a small sample is drawn, it is representative of the whole, and gives an estimation of the variation within the whole fleece. Other methods use single staples from typical fleece positions, for instance, shoulder, britch, &c., as a guide to genetic type and reaction, if any, to change of conditions.

The actual measurements are made microscopically on cross-sections or short fibre lengths. The former give information on the degree of variation from the circular, for the average fibre is elliptical in section, as well as on the mean fibre thickness and its variation. The results are usually expressed in graph form, where the percentages of each thickness group form the points, on which the curve is built. In Plate 2 a typical good grade Merino is compared with a cull from the same flock. The greater variation of the latter is striking.

[*Continued on page 434.*

Advanced Register of Merit

Standard for Dairy Cows

By W. J. Yuill, Supervisor of Herd Testing

Four generations of "Elm Grove" Jerseys owned by Messrs. R. G. Gay and Son. The three cows have qualified for the advanced register, while the heifer has a yield of 369 lb. butter-fat as a junior two-year-old.

THE advanced register of merit for dairy cows was introduced into Victoria for the first time last year, its main object being to supply more information of the individuality of the tested stock from which farmers were selecting their herd sires. The register provides details of lifetime yields and the highest production figure during a cow's life, together with her four highest *consecutive* yields which have been age corrected. Details of breeding and ownership and the age of the animal are shown also.

All of the cows of each breed appearing in this issue of the advanced register have passed the same minimum standard of "production attainment" as was required of each animal listed in the first issue of the register, viz., 400 lb. butter-fat of age-corrected yield in four consecutive years. The position of any cow on the register may change from year to year since higher yields by new young cows may force others down the list, while an improved record may lift an individual into a higher place. In no case, however, can a cow ever appear with a lower "production attainment" figure, than that which gained her admission to the register.

Mr. F. A. Williams' "Ballara Bonnie"—fifth on the advanced register with 674 lb. butter-fat.

Some members of Mr. J. E. Chadderton's "Glen Leigh" Jersey herd, several of which appear in the advanced register.

A perusal of the register, which appears at the back of this *Journal*, indicates that merit may take different forms. The main claim to merit of some individuals is their high yield rather than the number of times that it may be attained, while others may produce less butter-fat per lactation but over a longer period of years—a sure sign of good constitution, whatever the cow's appearance may be.

The remarkable strain of Madeiras in Mr. R. M. Chirnside's herd has many representatives on this register, including "Mornmoot Princess Madeira," and her daughter "Mornmoot Princess Madeira 3rd." Each has exceeded 700 lb. butter-fat on three occasions, and they occupy the leading positions on the register over all breeds.

When due consideration has been given to the fact that concentrates have been used on a conservative scale or that certain individuals may be members of unusually large herds, it will be seen that there are some excellent cows which possess considerable merit although they may have only medium records. Certain families, too, have qualified easily for the register through several generations. This fact is illustrated by members of Messrs. R. G. Gay and Son's "Elm Grove" stud, and of Mr. J. E. Chadderton's herd at Hamilton.

That the percentage allowances recommended by the Department of Agriculture are liberal and sound, is evident from a comparison of the average yields of each class (see accompanying table), and the average yield of all mature cows. It is also evident that the minimum yield of 400 lb. of butter-fat for advanced register mature cows should not be difficult to attain, for the average yield of all such cows—good, bad and indifferent—is 399 lb., only 1 lb. below the suggested level.

It will be seen from the table that the mature cows and first calvers have almost identical "mature equivalent" yields. The latter group includes all animals of this age in the respective tested herds, while the former is a much culled class, and usually contains the "good

Butter-Fat Yields of Each Age Class—Standard Herd Test, 1939-40.

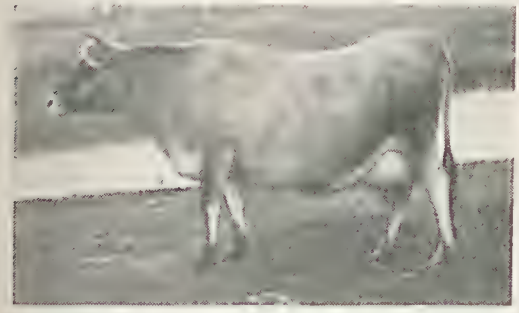
Age.	Class.	Number Tested.	Average Yield Butter-fat.	Proposed Age-correction Factors.	Mature Equivalent Yield when Age-correction Factors are Used.
			lb.		lb.
Under 24 months	(No class at present)	..	..	1·35	..
24–30 months	Junior 2	400	309	1·30	402
30–36 „	Senior 2	180	334	1·25	417
36–42 „	Junior 3	150	350	1·20	420
42–48 „	Senior 3	140	360	1·15	414
48–54 „	Junior 4	128	375	1·10	412
54–60 „	Senior 4	107	392	1·05	412
Over 5 years	Mature	539	399	..	399

old" cows of the herd. However, despite this handicap, the addition of 30 per cent. age-allowance is sufficient to raise the average yield of the whole group of unselected heifers to that of the mature group. In an extensive survey, conducted by this Department, of a large number of animals, whose yields were available from heiferhood to maturity, similar results were obtained. It is apparent that the age-correction factors in use are liberal, for they raise the average yield of each group above that of the well-culled mature cow level. It has been found, also, that the average difference in yield at the different ages of the same cows is similar to that seen when the average yield of large groups of cows of varying ages are compared.

"Gold Star of Melrose" (17 years of age) with one of his most recent daughters. "Gold Star" has sired many consistent producers and several of them appear in the advanced register.

With few exceptions, all of the animals listed in this register are alive and on the property of the owner indicated. In all, there are 268 qualified cows of varying ages, an interesting feature being that 65 per cent. of these has exceeded a level of 450 lb. age-corrected yield.

The names of many remarkable "long distance" cows also appear. The most outstanding of this group is Messrs. T. M. Noble and Son's "Linga Longa Wattle Speck." She has calved annually since beginning test in 1928. Her best four age-corrected yields average 519 lb., while her life-average over twelve lactations is 457 lb. "Wattle Speck" is the only cow on this list to exceed 5,000 lb. butter-fat, and she is due to re-calve in September. The champion test cow, and leader of this register, viz., "Mornmoot Princess Madeira" (4,944 lb. butter-fat), and "Ballara Bonnie" (4,768 lb.) will soon reach the 5,000 lb. butter-fat level, a distinction gained by very few test cows in this State.



Messrs. T. M. Noble and Sons' "Linga Longa Wattle Speck," the most outstanding "long distance" cow on the advanced register.

There are three qualified cows of the 1921 "vintage" still alive at the ripe old age of nineteen years. They are "Rosemont Laura" and "Rosemont Lassie," each with seven test records. A very unusual cow is "Antimony's Trixie of Bell Vue," who is still under test at eighteen years. Another old cow is "Tiny of Beverley," with a ten-year average yield of 393 lb. butter-fat, while "Willow Park Duchess 7th" has averaged 362 lb. over a similar period.

In the nine-year section, "Belgonia Marie 4th" leads with the excellent lifetime yield of 4,515 lb. butter-fat, and a top yield of 598 lb. There are also numerous examples of cows with seven or eight test periods to their credit.

"Donside Lydo Lady" (598 lb. butter-fat for six years) leads in the Ayrshire section of the register with 628 lb. for her best four years, thereby enhancing her claim to greatness. In the Guernsey section, "Clara's Fashion 7th" (Imp.) leads with an age-corrected yield of 563 lb. Three of the five qualified Guernseys are owned by the young breeder Mr. A. Fixter of Boisdale. "Dulcie" (eight years, 387 lb. butter-fat), and "Rosebud" (seven years, 357 lb.) are consistent producers. Their age-corrected yields are 449 and 452 lb. respectively.

"Victoria Belfry" leads the Friesian section with a 541-lb. production attainment, while

her herd-mate "Victoria Quilt" has the fine seven-year record of 492 lb. butter-fat and an age-corrected yield of 520 lb. "Greenvale Segis Patch" owned by Mr. M. T. Hore of Leitchville, also exceeds the age-corrected yield of 500 lb., while "Warwick Magpie Woodcrest," owned by Mr. S. C. Walker of Swan Hill, appears for the first time with a top yield of 636 lb. butter-fat and a production attainment of 459 lb. In the Red Poll section "Victoria Eructation" (eight years, 357 lb. butter-fat and 405 lb. for her best age-corrected record), appears together with her daughter "V. Volt" who leads this section with a 501-lb. production attainment.

A young breeder from Swan Hill, Mr. F. T. Butcher, of the "Maryville" stud, has a representative in "Elva," whose 446 lb. yield shows her to be a worthy descendant of his champion cow "Eve," who in past years exceeded 500 lb. butter-fat. Space does not permit the making of individual reference to the many other fine records which have been attained, but the full list of cows which have qualified to be placed on the second advanced register of merit appears at the end of this *Journal*.

Manuring Peach Trees—*Continued from page 423.*

$\frac{4}{5}$ lb. of sulphate of potash, was two-fifths as much again as that from the check plots. It will readily be seen that it was more profitable to apply the extra $2\frac{2}{5}$ lb. of sulphate of ammonia than the super. and potash. The reason why the Zerbe's responded proportionately to the increasing amounts of nitrogen may be that they were large trees and required larger amounts of nitrogen, while the Wiggins were smaller and required less.

The super. only plots at Kyabram decreased in vigour and production just as though they had been unfertilized, while the trees which received 2 lb. of sulphate of potash in addition to 4lb. of super. and 4 lb. of sulphate of ammonia did not yield significantly more than those receiving super. and ammonia only. No differences in other characters due to super. or potash were noted.

This lack of response to super. and potash may be due to the fact that they are not growth-stimulating plant foods in the same way that nitrogen is; and they are both much more difficult to get into the trees' root system than nitrogen because of the "fixation" which can occur on chemical reaction with the soil. Further, it is quite usual to add super. to improve the growth of cover crops, and this may reach the tree indirectly, while most Australian soils are reasonably rich in potash and the sunny climate reduces potash requirements. It is possible that either or both of these plant foods have an influence on fruit quality, but much careful experiment and observation would be necessary to establish that fact. For the present it is not possible to recommend the use of potash in the peach orchard, nor of superphosphate except as an autumn dressing for the green crop.

Much more remains to be learned about fertilizing peach trees. The groundwork for a set of very comprehensive experiments with canning peaches is now under way at the Horticultural Research Station, Tatura, which is devoted to the investigation of problems which are extremely difficult to attack in a commercial orchard.

* * * *

To sum up our present knowledge, the peach grower who, as part of his sound orchard practice, grows a good cover crop each winter, and who gives his trees a moderate quantity of nitrogenous fertilizer each spring, need not fear the dwindling supplies of animal manures, but may rest content that his trees are well fed. The grower who does not, is risking the health of his trees, their produce and his profit.

As this article is going to press, indications are that full supplies of nitrogenous fertilizers may not be available next year. Should any move be made on a national scale to use the limited nitrogen supplies to best advantage, the facts presented in this paper may assist in pointing out that the peach tree is a plant which needs nitrogen and gives a profitable return. Nevertheless, growers would be well advised to pay special attention to other sources of nitrogen, and to conserve their supplies. Possible supplies of animal or organic manures should be investigated, preference given to leguminous cover crops, and every care taken to avoid excessive leaching of the soil by irrigation water. Those who do so will be performing a national service as well as profiting personally.

Caseous Lymphadenitis (Cheesy Gland) of Sheep

By B. H. E. Barraclough, B.V.Sc., Veterinary Officer

UNTIL recently many sheep owners have wondered why they were urged to adopt precautionary measures to eradicate the disease known as caseous lymphadenitis, or as it is more commonly called, cheesy gland, especially as sheep usually show no ill effects as a result of infection. Now, however, it is generally known that no lamb or mutton carcass which shows the slightest trace of cheesy gland will be accepted for consumption in Great Britain; hence the importance of having as high a percentage of clean carcasses as possible.

Cause and Nature.

The disease, which is essentially a chronic one, is caused by the bacillus known as *Corynebacterium ovis*. On entering the body of the sheep the bacilli are caught up in one or more of the lymph glands or "kernels" which occur in various parts of the body. The lymph gland affected is usually that nearest the point of entry of the causative agent. The affected gland increases in size, as the microbes in it multiply, due to the formation of a pus which is usually greenish in colour. The tendency is for this pus to become converted into a cheesy material. Hence, to be able to readily recognize the disease, one should know the appearance of both the pus and the cheesy material. The latter tends to have less of a green hue.

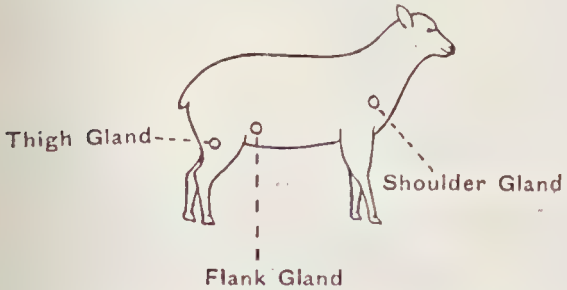


FIGURE 1.—Sketch of sheep showing lymphatic glands most commonly affected with caseous lymphadenitis.

[Dept. Agric., N.S.W.

Fig 2.—Lymphatic gland, showing abscess.

[Dept Agric., N.S.W.

If one of the lymph glands situated just beneath the skin (see Fig. 1) becomes affected there is a tendency for the abscess in it to burst and discharge on to the body surface where it mats the wool. This discharge is a prolific source of infection as the wool protects it from the action of the sun's rays, and at shearing time the matter may be transferred from one sheep to a cut on another by the shears, the combs or even the clothes of the shearer. A certain amount of skill is required to feel these glands easily by hand, but once that skill has been acquired it is relatively simple to differentiate a normal from an enlarged gland.

The only signs of the disease in affected sheep are the swollen superficial body glands, and, of course, these are noticed only in those sheep in which the superficial glands happen to be affected. It is possible for a sheep to have a large cheesy gland abscess in its chest cavity and yet, apparently, be perfectly healthy.

Means of Infection.

For an infection to be set up in a sheep's body the causal organism (*Corynebacterium ovis*) must go directly into the tissues. For example, it is most unlikely that sheep ever become infected by eating the organisms,

Fig. 3.—Enlarged shoulder gland almost ready to burst. Note shedding of wool over abscess.
[Dept. Agric., N.S.W.

unless there are wounds in the mouth cavity, or elsewhere in the digestive tract, in which case there is no hindrance to direct tissue entry.

During a sheep's life various wounds are inflicted on it, and through any of these infection may take place. Consider marking wounds first. These consist of ear-marking, docking, and castration. The most usually contaminated of these three wounds is that caused by castration, especially if the lamb is not placed on the ground carefully when marking is finished. The docking wound comes next in order of probability of infection and the ear-marking wound last. However, neither of the latter two are very likely sources of infection. But, if marking is carried out year after year in the same yards, the ground is likely to become heavily contaminated with the germ of cheesy gland and the risk of infection of all three wounds naturally increases. Hence it is most important to mark lambs in temporary yards on fresh ground each year. This is a sound practice for the prevention of other diseases as well, and is one of the hall marks of good sheep husbandry.

Now, to consider what is recognized as the most prolific source of infection—the shearing shed and its surroundings. Mention has already been make of swollen infected superficial lymph glands and the discharge which frequently results from these. It is inevitable that sheep will be wounded while being shorn, and it will easily be seen how the combs will become infected from the discharge of a suppurating abscess on one sheep, and then this infective discharge will be conveyed into the tissues of another sheep, which is wounded while being shorn soon afterwards. Again, the discharge from a burst abscess—especially in a shoulder gland—may accidentally be rubbed on to the shearer's pants and then when the next sheep is being shorn and is perhaps wounded the tissues will become infected from this discharge.

If the counting-out yards are contaminated with cheesy gland abscess discharges it is likely that shearing wounds will become infected if sheep lie down in these yards, or if they fall after coming down the chute from the shed to the yard, also if the yards are dusty and the day windy the organisms can easily be blown about with the dust and lodge on a wound and start the disease in that particular sheep. What has been said of shearing wounds applies in the main to crutching wounds which may become contaminated.

The fact that the channels of infection just described are the principal ones is undoubtedly true. But what is the explanation of infection in lambs which have neither been shorn nor marked? First of all, it must be stated

Fig. 4.—Ewe showing abscess in udder and in gland adjacent to udder.
[Dept. Agric., N.S.W.

that the percentage of such infection is extremely low, and there are various explanations for it. For instance, when the lymph gland, which is found above and behind the ewe's udder, is infected it is quite possible for the lamb to take the causative organism into its mouth when sucking, and then the organism finds its way into the tissues via a small mouth wound. If any of the other superficial lymph glands of the ewe are discharging the lamb will obviously always be prone to infection while running with its mother.

It may well be asked to what extent contamination of pastures is a source of infection. The fact that infection does not enter lambs via navel wounds to any extent shows that pasture contamination is apparently a small factor in infection. Experimentally it is quite easy to infect lambs via the navel merely by swabbing it with a small amount of culture or pus.

Prevention.

Prevention is all important as there is no known cure for this disease. The best way to approach the question of prevention is to consider the means of infection and then adopt appropriate counter measures.

Marking.—The use of temporary yards on fresh ground cannot be urged too strongly. It is of paramount importance. When marking is finished put the lamb carefully on its feet. On properties where infection is heavy, consideration must be given to the bloodless methods of castration and docking. Knives, pliers, &c., used in marking must be kept clean by immersion in disinfectant after each lamb (1 teaspoonful of lysol to 1 pint of water).

Shearing. — The shed must be cleaned thoroughly before shearing starts each year. A good method is to scrub it with hot water and soda, and then wash it thoroughly with carbolic acid or phenol or some other reliable disinfectant solution. Clean chutes and counting-out pens are necessary. Pens under the shearing shed are unwise, as they are so difficult to clean and the sun's rays cannot reach them. It is wise to remove the surface soil of the counting-out pens and replace it with fresh clean soil, which should be dampened so that dust will be reduced to a minimum. Some owners have adopted the very wise course of concreting the counting-out pens. This ensures absence of dust and facilitates cleaning. It must be obvious to sheep owners that by adopting these precautionary measures they are also helping to protect their sheep against other diseases, such as tetanus and malignant oedema.

Fig. 5.—Showing enlarged flank gland.
[Dept. Agric., N.S.W.

If, when the sheep are brought in to be shorn, any are noticed with swollen or burst glands, they should be put to one side and shorn last. Crowding and bustling sheep will increase the likelihood of swollen glands bursting and discharging and of this discharge contaminating other sheep. Wherever possible, lambs should be shorn first to lessen the risk of infection via shearing wounds.

It is a wise procedure, especially in a stud, to handle all the sheep once a year, and to cull or at least isolate any which show swollen glands. This may be impracticable on large runs, but should be done wherever possible. Any stud sheep purchased should be examined thoroughly before being placed with the flock. It is much easier to pick up enlarged glands in freshly-shorn sheep, therefore they should be gone over soon after they have been shorn.

An ideal course to follow would be to clean combs, cutters, and shear blades after each sheep. The difficulties are realized, but it should be possible to do this on small studs, and it should certainly be done on any property after a case of cheesy gland has been shorn. The method is to remove all grease from combs, &c., and then thoroughly immerse them in 2 per cent. soda or 3 per cent. lysol.

If shearer's clothes become soiled with matter from an abscess they should be changed.

On properties which show a large percentage of infected cases it is wise to dip the sheep off shears with a non-poisonous—*not arsenical*—dip.

Vaccination and Diagnostic Testing.

Much work has been and is being done in an endeavour to find a vaccine with which to artificially immunize sheep against cheesy gland infection. Difficulties have been encountered, but some progress has been made. However, as a vaccine, if found, would probably have to be administered once a year obvious difficulties arise in the case of large numbers of sheep. But a suitable vaccine could be used by the owners of small stud flocks.

It is possible to discover whether live cattle have tuberculosis by means of the tuberculin test, even when the cattle show no signs at all of the disease. So far no test has been found which can perform a similar function in the case of non-clinical cases of cheesy gland in sheep. It would be a great advantage to have such a test so that valuable sheep could be certified free of the disease, and the Council for Scientific and Industrial Research is sparing no effort to find a diagnostic agent.

Scientific Aids to the Breeder and Pastoralist

(Continued from page 426.)

It has been demonstrated experimentally that in the mating of extreme types of the Merino the progeny often show an even greater variability than the parents. In Plate 3 the ram is much "stronger" than the ewe. The lamb from these two is more variable than either parent. Mating of two sheep similarly uniform in fineness may be expected to give progeny of like uniformity, and this is confirmed by breeding practice. Skinfolds tend to produce unevenness in the wool. The deterioration of the wool of a certain animal, or the changes associated with age, may be readily observed and evaluated by these determinations.

Uniformity of fineness is generally associated with uniformity in other fleece characteristics, such as fibre length. This factor would work towards a better "tear" or less noil, i.e., fibre too short for the best textile manipulation. On the other hand, wool fineness may be influenced greatly by changes in nutrition, and the staple altered decidedly in quality due to this factor. Drought, ill-health of the animal, the strain of reproduction, are all capable of causing quality changes. These are additional factors which may cause reduced uniformity, and they are not readily controllable.

Testing for the breeder and pastoralist has been carried on widely in South Africa, where fleece weights, fibre uniformity, and fleece densities have been of most importance, and in New Zealand, where the prevalence of hair in the Romney and crossbreeds has caused a very active interest. Facilities for the testing of wool fibre are available at the Gordon Institute of Technology, Geelong.

Cleaning Beeswax

Beeswax represents only a very minor part of an apiarist's income, and like many other minor things, is often neglected, and reaches market in a condition totally unsuitable for sale. To secure top values, it is necessary that the wax should be of a good yellow colour and well cleaned. This colour can be obtained only in wax from cappings or new combs, but clean wax can always be produced provided plenty of water is used and the wax rendered at least three times.

When liquefying the wax in vessels of water do not allow the water to reach boiling point, as this causes a certain amount of the wax to separate into small particles. Observance of the following rules will help in improving the quality of your beeswax.

Use only clean tinned metal containers.

Set cakes of wax slowly on hot water.

Never use bleaching agents, such as vinegar, sulphuric acid, &c.; they ruin the wax for many purposes.

Live Stock Notes

Reminders for September—October

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Calcium and Phosphorus.

(The first part of this discussion on minerals for stock was published in Live Stock notes for the June issue of this Journal).

IN addition to variations due to climatic and seasonal conditions and strains and species of plants, the mineral content of fodders depends to some extent on the quality of the soil and the manurial treatment of the soil on which the fodders are grown. Also in respect to lime and phosphoric acid, it is noticed that fodders rich in protein are also rich in phosphoric acid, but the protein content has no relation to the quantity of lime present in the fodder. As far as lime and phosphoric acid are concerned, most fodders can be grouped under three headings, as follows:—

(1) Lime-rich and phosphoric acid-rich fodders.

(2) Lime-rich and phosphoric acid-poor fodders.

(3.) Lime-poor and phosphoric acid-rich fodders.

Lime-rich and Phosphoric Acid-rich Fodders.—High quality green pasture grasses, growing cereals and hay made from these plants usually contain lime and phosphoric acid in approximately equal quantities, and there is usually sufficient of both minerals to meet the requirements of animals under normal conditions.

Clovers and most other leguminous plants usually contain much more lime than phosphoric acid. In the very green young, succulent stages, the lime content is usually only slightly in excess of phosphoric acid, but as these clovers and legumes mature, the proportion of lime increases until at the hay stage there is up to five times as much lime as phosphoric acid. Legumes are practically the only fodders which contain an over-abundance of lime, and it is largely for this reason that they are such valuable animal foods. Hays, particularly lucerne hay, made from these leguminous plants, also contain ample lime which is of great value in helping to make up lime shortages which exist in the majority of fodders usually used for hand—or supplementary—feeding. These lime-rich fodders also contain ample phosphoric acid for the needs of the animals.

Milk, milk products and meat meal made from whole carcasses or meat and bone scraps also contain ample lime and phosphoric acid.

When these fodders constitute the bulk of the rations, the animals will normally not require any additional lime or phosphoric acid supplements. A lick containing common salt only, however, may be necessary.

Lime-rich and Phosphoric Acid-poor Fodders.—Foodstuffs poor in lime and phosphoric acid include pasture and other forages grown on poor, acid, marshy or worn out soils, straw and hulls or husks. Most native, unimproved pastures also fall into this category. Unmanured soils growing sorrel, soursop (*Oxalis* spp.) and similar acid-loving plants, will usually produce pasture and other forages low in both lime and phosphoric acid. When such fodders are grazed or fed, cattle, particularly dairy cows, should be given additional calcium phosphate. This can be administered by adding bone flour, bone meal, or di-calcic phosphate to common salt. Mix one bag of the former with two, three, or four bags of the salt, and place it out as a lick, or in the case of dairy cattle, add 1 oz. of bone flour to the bail ration of each cow daily. When these fodders form a large proportion of the rations, young and breeding horses should also have access to a lick containing calcium phosphate or be fed mineral supplements similar to those recommended for dairy cows, but, from work done by the Council for Scientific and Industrial Research, sheep will not necessarily require any phosphatic licks.

Lime-poor and Phosphoric Acid-rich Fodders.—Excluding hay, chaff and milk products, straw and husks, practically all commercial fodders can be classed under this heading. Such fodders include all cereal grains, seeds

and fruits of all kinds, potatoes, all by-products such as bran, pollard, brewers' grains, malt coombs, barley and oat bran, maize germ meal, peanut meal, linseed meal, cocoanut meal and even meat (flesh) and blood meals.

It has long been realized that poultry and pigs, which are fed principally on fodders included in this group of foodstuffs, require lime supplements. These are fed in the form of shell grit to poultry and in the form of powdered limestone, chalk or slaked lime to pigs. But few dairy farmers and sheep farmers yet realize the value of feeding additional lime or lime-rich fodders, such as lucerne hay, in conjunction with these lime-poor foods.

Horses are particularly susceptible to bone diseases which are brought about by feeding rations containing excess phosphoric acid. These diseases can easily be overcome by feeding lime or lime-rich fodders as already recommended for dairy cattle.

It has been shown that animals require from one to two or even up to five parts of lime for each part of phosphoric acid, and yet most of these common concentrates contain many more parts of phosphoric acid than of lime. For instance, maize contains about 20 times more phosphoric acid than lime, bran about 18 times more, wheat 16 times more, oats 7 times more, linseed meal 4 times more, and so on, making it necessary to add lime in the same way as it is added to the rations of pigs when all other stock are heavily fed on these concentrates.

For pigs, four parts of lime, either ground limestone, chalk or slaked lime, are mixed with one part of common salt, and 3 lb. of this mixture is added to each 100 lb. of grain or concentrate meal. This mineral preparation, or one made by mixing equal parts of lime and salt, can be similarly fed in the concentrate rations of horses, cattle and sheep; or, for horses and cattle, which are being fed on these lime-poor phosphoric acid-rich foodstuffs and which are usually fed individually, 2 oz. or a heaped tablespoonful of either preparation could be added to each animal's daily ration. For very heavily fed milking cows, up to 3 oz. of this lime-salt mixture may be advisable.

One bag of lime mixed with two, three, or four bags of salt makes a suitable lime-salt lick. This should be set out in suitable places in the paddock, accessible to the stock.

Sour silage, although on analysis not necessarily deficient in lime, should be fed in conjunction with a lime-salt supplement, as mentioned above, to neutralize the acid. Otherwise, lime required for metabolism may be used to neutralize the acid and symptoms of mineral deficiency occur. Similarly, lime is required to neutralize many acids which are characteristic of some plants such as sorrel, soursop, rhubarb, &c. Frequently, in neutralizing the acids the lime in the food becomes unavailable to the animals.

Top-dressing and manuring with superphosphate increase the phosphoric acid content of many forage plants without altering the lime content, while manuring with potassic fertilizers may reduce the lime content of the fodders produced. Stock, more especially dairy cattle, may show signs of lime deficiency when grazed on pasture and fed hay from land top-dressed with these fertilizers. This can be corrected by feeding lime as already recommended.

Although the feeding of bone flour may not necessarily be injurious with these fodders, the phosphoric acid in the bone flour is unnecessary. Lime is a much cheaper mineral supplement and supplies the mineral (calcium) which is required.

Dairy Cattle.

Cows should now be mated to re-calve early in July next year. Dairy farmers who have not a suitable bull on hand should therefore endeavour to secure one immediately. Most auction sales of stud stock are held later on because the animals offered will have their new coats and be in better condition, but it will be getting too late to purchase a bull for this year. Frequently at these auction sales, the bulls of serviceable age are "left overs." Nevertheless, a good selection of early bull calves may be offered from which good ones can be secured at reasonable figures for light work next season. Many farmers prefer buying a bull calf because they have a large number to select from, because they can usually buy at a lower price, and because they can rear the bull better.

Spring top-dressing of the pastures should now be completed. In favoured districts, it should be possible to reduce hand feeding to a minimum, but in late districts and in northern Victoria considerable hand feeding will be necessary for some time.

All dairy farmers should aim at producing best quality cream. With new cows coming in and the work in the cowshed increasing daily, there is a possibility that insufficient care will

be given to the proper washing of the teats, udders, hands, machines, and utensils. Clipping of the hair from the udders will greatly assist in keeping them clean. It is also necessary to see that milk from newly-calved cows is kept separate until it is normal (usually four or five days). If these points are observed, considerably less cream will be graded down in the early spring months.

Horses.

With petrol rationing in view, horse owners are urged to break in any unbroken horses, and whenever possible to make full use of horse power on the farm for traction and transport purposes.

From time to time, horse owners are called on to hand feed or artificially rear young foals. In this regard it should be remembered that mare's milk differs from cow's milk, in that it contains less protein and fat, but more sugar. When rearing foals on cow's milk, add 5 oz. (¼ pint) of boiled water, and one dessertspoonful of sugar to each 20 oz. (1 pint) of cow's milk. Feed foals five times daily, gradually increasing the quantity up to 8 quarts a day. —(W. D. Shew, B.V.Sc., Senior Veterinary Officer.)

Veterinary Notes.

Cows heavy in calf, especially if on short green pasture or subject to attacks of milk fever, should be given one tablespoonful of bone flour twice daily in a little hand feed for at least six weeks prior to calving date, but if grazing on heavily top-dressed pastures a tablespoonful of lime should be given instead of, or in addition to, bone flour, as already indicated in these notes.

To control the spread of hydatids in man and animals, dog owners are warned not to feed raw offal to dogs, and to regularly dose all dogs on the farm with arecoline. Full particulars in regard to dosage, &c., will be supplied on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.—(W. D. Shew, B.V.Sc., Senior Veterinary Officer.)

Sheep.

Sheep classing should be carried out at this time of year, three to four weeks before shearing. Surplus sale and culled sheep should be taken out and either ear marked, branded or run separately so that they can be identified after shearing. Sheep classing is not only necessary for wool producing and dual purpose breeds, but also for fat lamb producing breeds where good, big, roomy ewes are desired. If not already attended to, arrangements for the selection of sires for the coming season should now be made.

All preparations for shearing should now be completed, so that necessary yards, sheds, machinery, and other gear are in good working order, and the necessary supply of spare parts on hand. This preparation is very necessary, since any hold-up during shearing adds greatly to its cost. (N. A. Bowman, Sheep and Wool Expert.)

Pigs.

Farmers who aim at increasing their production of pigs should first consider their potential food supplies. Most dairymen who feed pigs on separated milk could grow more pigs by supplementing the milk with grain and other foodstuffs. It usually pays to feed some grain with the milk, but unless there is a favorable ratio between the price of grain and the price of pigs it does not pay to supplement the milk with unlimited quantities of grain.

Where soil and climatic conditions are favorable for their growth, mangels and pumpkins are useful crops, as they are heavy yielders and are ready for feeding when the milk supply is low. Fifty tons of mangels or 35 tons of pumpkins provide sufficient food material to satisfy the appetites of a breeding sow for one year, and of her two litters of pigs (15) up to 140 lb. dressed weight. Such foods as mangels and pumpkins are too bulky to be used as the sole diet of pigs and they should be fed in conjunction with concentrates such as cereal meals, skim milk, or meat meal.

The provision of such crops helps the pig raiser to bring his pigs through winter in better condition, and it avoids the necessity of having to sacrifice store or unfinished pigs on a market which does not require them. (L. A. Downey, Pig Expert.)

Poultry.

Feeding Turkeys.

The feeding of turkeys differs but slightly from the feeding of fowls, so that the principles that apply to fowls apply equally well to turkeys. Although, as in the case of chickens, it is not usual to feed the young turkey poults for the first 36 to 48 hours, they may be fed as soon as they will start to eat.

The first feed should consist of a good chick mixture, which can be given either as a dry or a wet mash. The usual custom is to have a

[Continued on page 450

Inspections under the Fertilizer Act

Results of Analyses

By W. C. Robertson, Chemist

THE number of samples withdrawn, under the provisions of the Fertilizers Act, from parcels of artificial fertilizers which were found in stock at factories and stores throughout the State during the 1939 season totalled 25. Two out of every three of these samples consisted of blood and bone or kindred organic fertilizers. This does not indicate the sudden discovery of some new virtue in this class of material, but rather that inspectorial activity has been concentrated upon fertilizers of the natural organic type.

A study of the results of analyses of samples collected, which are appended, and the use of the unit value system in calculating values, will provide interesting information in the comparative value of the fertilizers (which are represented by the samples) as guaranteed and found.

There is no doubt that the introduction of the law to control the sale of artificial fertilizers in Victoria was necessary. This reform was quickly followed by a general improvement in fertilizer quality. Unscrupulous and dishonest manufacturers and dealers either went out of business or they soon saw the error of their ways and decided to manufacture and/or sell an article which was entirely free from adulteration, of fair average quality, and retailed at a reasonable price.

Nowadays, it can be safely said that the *bulk* of the artificial fertilizers which are sold annually within our State comply with the law to such an extent that the inspection of most stocks and consignments becomes merely a matter of routine. However, the *bulk* of artificial fertilizer manufactured or imported into Victoria belongs to the class which is known as chemical or mineral, of which superphosphate, sodium nitrate, sulphate of ammonia, potassium sulphate and chloride are common examples. It is in the animal fertilizer or organic section (which constitutes approximately 10 per cent. of the quantity sold yearly) that discrepancies between the quality of the fertilizer which is sold and that delivered are sometimes noticed. It is neces-

Making fertilizer analyses in the laboratory of the Department.

sary, therefore, to pay more attention to the manufacture and disposal of this type of product.

The organic section of artificial fertilizers comprises dried blood, blood manure, blood and bone, animal fertilizer, and bone dusts. The quality of both dried blood and blood manure leaves nothing to be desired. Dried blood, as the name denotes, is the residue remaining when animal blood is collected, coagulated, dried and ground to a commercial powder. It contains small amounts of potash and phosphoric acid, but is regarded in all parts of the world as a nitrogenous fertilizer. The nitrogen content will vary with the percentage of moisture, but usually ranges between 12 and 14 per cent. In recent years, the demand for dried blood as a stock food, particularly for use in poultry farming, has increased so much that its use as a fertilizer is becoming uncommon. Blood as a fertilizer is practically confined to blood manure, which is best described as impure dried blood, the impurities consisting of bone with some animal and vegetable fibre.

Nitrogen, in the form of blood, becomes available readily in the average mellow soil. It requires relatively high temperatures for its decomposition and therefore should be regarded as a summer fertilizer. Under the most favorable soil conditions, blood nitrogen will become wholly available during the life of a crop or within four months.

Blood and bone in the strictest sense of the term should be a mixture of dried blood and bone dust, but it usually consists of blood, meat and bone, or meat and bone. The main sources of supply are the freezing works which are situated in various parts of the State. There are many smaller plants in operation which produce the fertilizer from the carcasses of dead beasts, excluding the hair, hide, horns, and hoofs, which are either too valuable or too difficult to treat. The refuse obtained from local slaughter houses and butcher shops is also turned into blood and bone fertilizer.

Generally speaking, freezing works use the dry rendering process for the preparation of blood and bone, while the smaller plants use the wet method. In the former the raw material is "cooked" and steam-pressed and the pressed cake ground, whereas in the latter the tallow from the "cook" is "floated" off and the residue dried either naturally or artificially prior to being sent to the disintegration mill for grinding into blood and bone.

The fertilizer derived by either process will vary in quality and value depending upon the proportion of blood and meat to bone. The more bone the higher the percentage of phosphoric acid and the lower the nitrogen percentage, and vice versa.

Owing mainly to the active demand for meat meal and bone products as stock foods, the shortage of raw material for the manufacture of animal fertilizers is becoming more pronounced. Where this shortage is being overcome by the substitution of other materials and by-products, it is essential for the manufacturer to preserve the brand name of the fertilizer and observe the terms of the raw materials used in the application for the registration of the brand.

Instances may be quoted where the raw material used for the manufacture of blood and bone or animal fertilizer hardly conforms to the specifications. Whether the wool of a sheep or the hide from a horse is crude offal from the slaughtering of stock may be a debatable point, but an old suit or an ancient pair of boots could not by any stretch of imagination be classed as animal fertilizer, although both would contain approximately 7 per cent. of nitrogen. In cases where other manurial by-products are added to certain simple or compound fertilizers, either chemical or animal, no objection can be raised providing the purchaser is made aware of the composition of the fertilizer mixture and the derivation of the plant food is clearly shown on the label.

Although the main objective of the annual inspections under the Act is to ascertain whether the grade of fertilizer supplied is fairly representative of the quality guaranteed, there is another aspect. While the agricultural chemist is in the district on inspectional duty, the manufacturer, dealer, agent, and farmer all avail themselves of the opportunity, not only to discuss matters associated with the sale of artificial fertilizers, but also to have other problems connected with manures and manuring explained. This educational or extension service is of great benefit to all concerned.

In the Mildura district during the 1939 season the visiting chemist was asked to value a manure (?) which was said to come from the Broken Hill abattoirs and which was being retailed locally. Casual inquiry found that (1) the material was being sold as crude blood and offal from the abattoirs, and (2) local

block holders had a very vague idea of what they were purchasing. Although crude unmanufactured offal from abattoirs is not a fertilizer within the meaning of the Fertilizers Act, and therefore sales are not controlled or supervised in any way, it was deemed advisable in this case to obtain a sample for analysis with the object of obtaining some idea of its commercial value.

A sample for analysis was withdrawn from the stocks of a well-known block holder who had purchased a parcel of the material. In appearance, the manure resembled a sandy-loam soil, stone-brown in colour, on which some blood had been spilt. It appeared to be very wet, and the decomposing blood gave forth a foul odour which subsequently turned out to be its main attribute as an organic manure or fertilizer. The sample was subsequently analysed and a copy of the analyst's report forwarded to the block holder purchaser and the local press. The analysis figures and report are as follows:—

Moisture	16.7 per cent.
Ignition loss	4.9 per cent.
Ash (soil and sand) ..	78.4 per cent.
Nitrogen	0.31 per cent.
Phosphoric Acid ..	trace
Potash	trace

Remarks.—The material as a fertilizer is practically worthless. It contains approximately 80 per cent. of sand and soil with 16.7 per cent. of water. The fertilizer value is represented by the content of the three principal plant foods, viz., nitrogen, phosphoric acid, and potash, which only approximate that contained in a first class soil and which when calculated by the unit value system show the material to be worth only a few shillings per ton.

The advisability of purchasing natural manures or crude unmanufactured refuse and by-products at inflated values without first seeking or obtaining an analysis of a representative sample is bad policy. In the case quoted the material certainly was not worth the cost of transport from one paddock to another.

Blood and bone fertilizer bagged and stacked ready for delivery.

In the case of natural manure such as that obtained from pigs, sheep, cows, horses or poultry, the value will depend on (1) its water content, (2) its freedom from contamination with foreign matter such as straw, soil, ashes, lime, &c., and (3) to the quality of the food on which the bird or animal has been fed.

During the year, a sample, which was claimed to be pig manure, was examined at the request of a settler. The analysis proved the material to contain:—

Moisture	14.0 per cent.
Ash	50.5 per cent.
Nitrogen	1.8 per cent.
Phosphoric Acid ..	1.5 per cent.
Potash	5.4 per cent.

The material, both in appearance and from the analytical figures, was not deemed representative of pig manure. Probably it originated in a distillery and had been used in a piggery for some purpose. However, the settler was informed that the commercial value per ton was approximately £3, and as it was obtainable for the carting, the illustration is just another instance of the importance of the activities of the Act in disseminating useful information.

During the year, several prosecutions were instituted against manufacturers for offences under the Act. In more than one instance the prosecution failed or was not proceeded with owing to some technicality. All the violations occurred in the blood and bone or animal fertilizer section, and it is hoped that the current year will produce a decided improvement in the quality of this fertilizer.

RESULTS OF THE ANALYSES OF SAMPLES COLLECTED IN VICTORIA DURING THE 1939 SEASON UNDER THE PROVISIONS OF THE FERTILIZERS ACT 1928, No. 3680.

District in which Sample was Obtained.	Brand and Description of Fertilizer.	Analysis as Guaranteed by Manufacturer or Found by Chemist.	Nitrogen.			Phosphoric Acid.				Potash as Sulphate.	Manufacturer or Importer.
			As Ammonia.	As Blood and Bone.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		
			%	%	%	%	%	%	%	%	
Braybrook ..	A.N.A. Surprise Animal Fertilizer	Guaranteed	..	5·00	5·00	..	4·00	10·00	14·00	..	G. W. Pennell, Bourke-street, Braybrook
		Found ..	..	5·22	5·22	..	5·31	9·38	14·69	..	
,, ..	,, ,, ,,	Guaranteed	..	5·00	5·00	..	4·00	10·00	14·00	..	,, ,, ,,
		Found ..	..	5·47	5·47	0·69	3·77	11·24	15·70	..	
,, ..	,, ,, ,,	Guaranteed	..	5·00	5·00	..	4·00	10·00	14·00	..	,, ,, ,,
		Found ..	..	5·71	5·71	0·57	3·95	9·95	14·47	..	
Brooklyn ..	W. and M. in oval Blood and Bone	Guaranteed	..	5·00	5·00	..	4·50	7·50	12·00	..	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
		Found ..	..	4·13	4·13	..	3·48	6·64	10·12	..	
Kensington..	Cockbill's Blood and Bone	Guaranteed	..	5·25	5·25	..	2·00	8·00	10·00	..	J. Cockbill, 407 Post Office-place, Melbourne
		Found ..	..	5·49	5·49	..	4·40	5·52	9·92	..	
Braybrook ..	Pridham's Blood and Bone	Guaranteed	..	5·10	5·10	..	6·00	8·00	14·00	..	W. Pridham Pty. Ltd., Evans-street, Braybrook
		Found ..	..	5·10	5·10	..	5·95	7·87	13·82	..	
Mildura ..	Pannifex No. 1 Blood and Bone	Guaranteed	..	5·50	5·50	..	6·00	8·00	14·00	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
		Found ..	..	7·42	7·42	..	4·85	3·44	8·29	..	
Red Cliffs ..	A.N.A. Surprise Animal Fertilizer	Guaranteed	..	5·00	5·00	..	4·00	10·00	14·00	..	G. W. Pennell, Bourke-street, Braybrook
		Found ..	..	6·05	6·05	..	3·67	7·47	11·14	..	
Irymple ..	Sickle in diamond 22 per cent. Superphosphate	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
		Found ..	..	..	..	20·46	1·06	1·53	23·05	..	
,, ..	Sickle in diamond Superphosphate and Ammonia 3 : 1	Guaranteed	5·00	..	5·00	15·40	0·30	0·80	16·50	..	,, ,, ,,
		Found ..	4·97	..	4·97	16·88	0·45	0·82	18·15	..	
,, ..	Cresco 22 per cent. Superphosphate	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Cresco Fertilizers Ltd., Geelong
		Found ..	..	..	..	19·44	1·06	0·95	21·45	..	
Mildura ..	Solo Blood and Bone	Guaranteed	..	7·00	7·00	..	4·25	10·75	15·00	..	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
		Found ..	..	7·58	7·58	..	6·16	8·54	14·70	..	
,, ..	Sickle in diamond 22 per cent. Superphosphate	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
		Found ..	..	..	..	20·68	1·19	1·02	22·89	..	
,, ..	M.S.C. Animal Fertilizer	Guaranteed	..	5·50	5·50	..	4·50	6·00	10·50	..	The Mildura Shire Council, Mildura
		Found ..	..	5·85	5·85	..	3·43	8·59	12·02	..	
Redcliffs ..	Pivot II. Superphosphate and Ammonia	Guaranteed	5·00	..	5·00	15·30	0·30	0·80	16·40	..	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-street, Melbourne
		Found ..	5·20	..	5·20	15·82	0·37	0·50	16·69	..	
,, ..	Sickle in diamond Market Garden Manure	Guaranteed	1·70	1·50	3·20	11·50	2·50	3·10	17·10	2·42	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
		Found ..	2·26	1·35	3·61	12·86	2·31	3·08	18·25	2·49	
,, ..	Cresco Mixed Manure No. 1	Guaranteed	1·00	1·40	2·40	11·25	2·00	4·50	17·75	5·00	Cresco Fertilizers Ltd., Geelong
		Found ..	0·84	2·24	3·08	11·33	1·92	3·95	17·20	5·72	
,, ..	H.C.P. No. 1 Bonedust	Guaranteed	..	1·00	1·00	..	..	..	30·00*	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
		Found ..	..	1·87	1·87	..	..	..	28·37†	..	
,, ..	Cresco Superphosphate and Ammonia 3 : 1	Guaranteed	5·00	..	5·00	15·40	0·30	0·80	16·50	..	Cresco Fertilizers Ltd., Geelong
		Found ..	3·93	..	3·93	17·35	0·33	0·81	18·49	..	
,, ..	Cresco Sulphate of Ammonia	Guaranteed	20·60	..	20·60	..	..	..	..	..	,, ,, ,,
		Found ..	21·06	..	21·06	..	..	..	..	..	
Irymple ..	Bendigonian in oval, Animal Fertilizer	Guaranteed	..	4·50	4·50	..	5·00	10·50	15·50	..	Bendigo Fertilizer and Wool Co. Pty. Ltd., View Point, Bendigo
		Found ..	..	4·28	4·28	..	5·44	12·75	18·19	..	
Merbein ..	Pannifex's No. 9 Animal Fertilizer	Guaranteed	..	7·00	7·00	..	4·00	5·00	9·00	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
		Found ..	..	7·07	7·07	..	6·25	9·08	15·33	..	
,, ..	Pannifex's No. 4 Animal Fertilizer	Guaranteed	..	6·00	6·00	..	5·00	7·00	12·00	..	,, ,, ,,
		Found ..	..	5·79	5·79	..	4·41	9·66	14·07	..	
Melbourne ..	Pannifex Bonedust No. 2	Guaranteed	..	3·50	3·50	..	..	..	19·00‡	..	,, ,, ,,
		Found ..	..	3·97	3·97	..	..	..	23·58§	..	
,, ..	Pannifex No. 9 Blood and Bone	Guaranteed	..	7·00	7·00	..	4·00	5.00	9·00	..	,, ,, ,,
		Found ..	..	7·50	7·50	..	5·45	8.77	14·22	..	

* Guaranteed to contain 95 per cent. Fine Bone.
† Contained 82 per cent. of Fine Bone.
‡ Guaranteed to contain 50 per cent. Fine Bone.
§ Contained 54 per cent. Fine Bone.

Standard Herd Test, 1939-40—*Continued from page 419.*

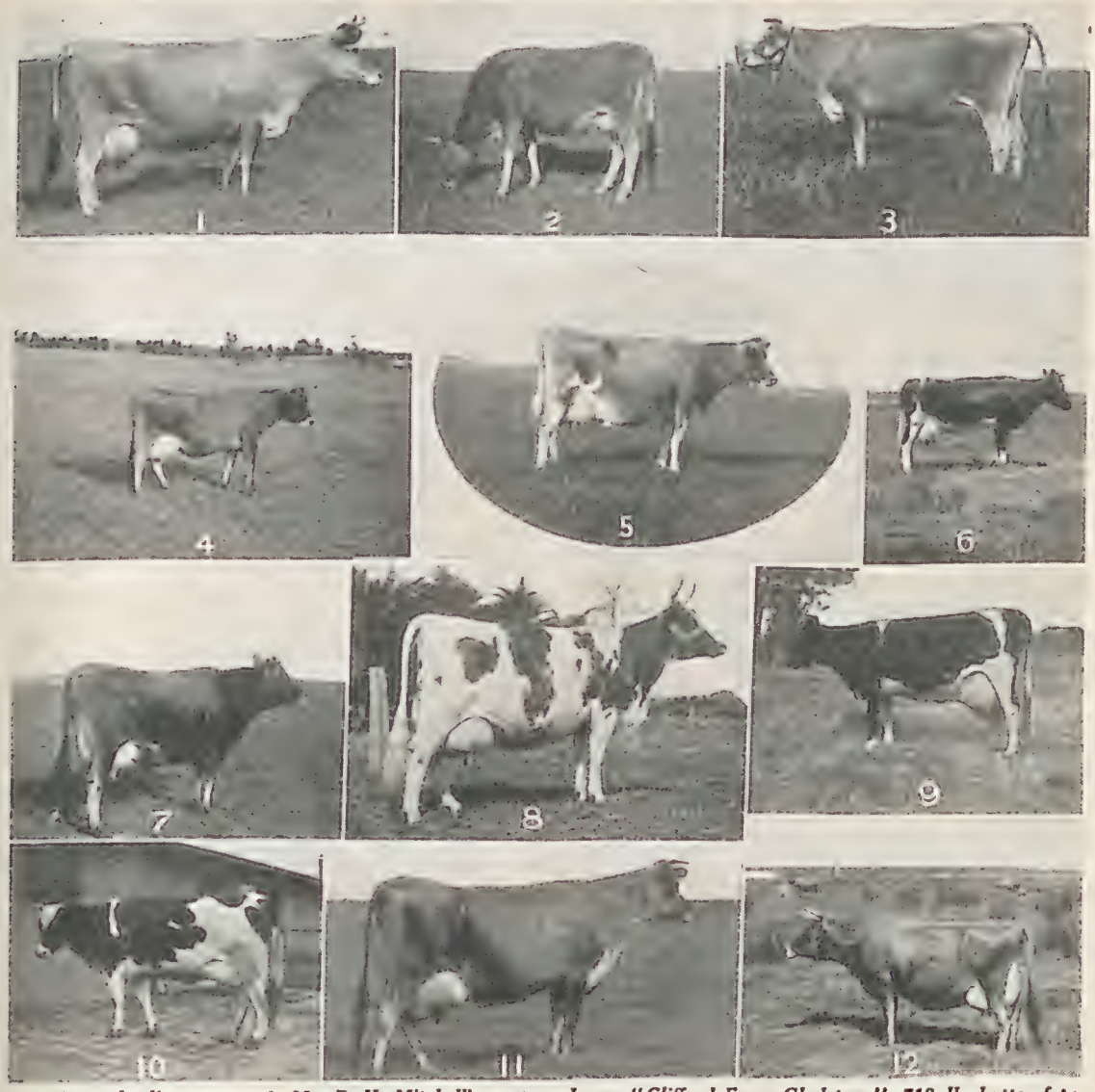
Junior Class Leaders.

Six Jersey studs are represented in the senior four-year-old class, the leader being "Bamawm Pretty Lady"—a granddaughter of that famous producer "Ballara Bonnie," whose four year production attainment of 674 lb. places her in fifth position on the Advanced Register of Merit. "Bamawm Pretty Lady," with an average of 486 lb.—all four yields made in junior form—also qualifies for the Advanced Register. Her dam, a 400 lb. junior, would doubtless have done likewise had it not been for an unfortunate accident. Mr. F. A. Williams, the owner, has, in this young cow, a worthy member of a really great family of producers.

THE SIX LEADING COWS IN EACH SECTION.

Owner.	Name of Cow.	Class.	Breed.	Butter-fat.
A. E. T. Payne	Rose Gem of Maple Lodge	Mature	Guernsey	856
F. A. Fraser	Glengowrie Ray	,,	Ayrshire	783
J. H. Goddard	Donside Lydo Lady	,,	,,	748
G. A. McNabb and Son	Maxon Countess Light	,,	Jersey	735
R. H. Mitchell	Clifford Farm Gladsome	,,	,,	718
R. M. Chirnside	Mornmoot Fancy Starbright	,,	,,	705
F. A. Williams	Bamawm Pretty Lady	Senior 4	Jersey	634
G. A. McNabb and Son	Maxon Noble Goldfinch 2nd	,,	,,	582
T. M. Noble and Sons	Finchley Bluebell	,,	,,	576
J. E. Handbury and Son	Tooravale Princess 18th	,,	,,	575
F. Austin	Avalon Starbright's Duchess 2nd	,,	,,	551
N. C. De La Rue	Lucerne Vale Madeira 3rd	,,	,,	546
F. W. Clarke	Mer Vue Sister	Junior 4	Jersey	662
C. S. Walker	*Warwick Maggie Walker	,,	Friesian	618
Salesian College	*Braemore Princess Domino 7th	,,	,,	612
Dookie College	Dookie Peony	,,	Ayrshire	575
P. J. Maloney	Belgonia Junette 3rd	,,	Jersey	572
G. A. Fraser	Bonnie Doon Heatherbell	,,	Ayrshire	566
J. E. Handbury and Son	Tooravale Bettws-y-Coed	Senior 3	Jersey	542
C. W. Macauley	Taranah Radiance 2nd	,,	,,	527
F. Austin	Avalon Starbright's Pansy 4th	,,	,,	522
J. G. Norman	Banaview Lilac Domino 7th	,,	,,	515
C. W. Macauley	Taranah Rainbow 2nd	,,	,,	515
A. E. T. Payne	Yarraview Teeney	,,	Guernsey	511
T. M. Noble and Sons	Finchley Nasturtium 5th	Junior 3	Jersey	556
R. M. Chirnside	Mornmoot Princess Madeira 9th	,,	,,	551
T. S. Powell	Carellen Mermaid 2nd	,,	,,	549
R. M. Chirnside	Mornmoot Fancy Madeira 6th	,,	,,	544
W. K. Atkinson	*Willow Park Duchess 30th	,,	Dairy Shorthorn	526
F. Austin	Avalon Madeira's Pansy	,,	Jersey	526
J. H. Goddard	Inverurie Bluebell	Senior 2	Ayrshire	602
R. M. Chirnside	Mornmoot Princess Madeira 7th	,,	Jersey	589
Estate of late J. D. Read	Springhurst Ronald's Alsyke	,,	,,	545
R. M. Chirnside	Mornmoot Mimi	,,	,,	542
Nancarrow Bros.	Pine Ridge Lady	,,	,,	502
Estate of late J. D. Read	Springhurst Blonde Nightshade	,,	,,	496
A. E. T. Payne	Yarraview Benefactoress	Junior 2	Guernsey	521
C. G. Lyon	Banyule Tiddlewinks 26th	,,	Jersey	511
W. J. Wade	Inverbroom Ruby's Marie	,,	,,	508
Estate of late J. D. Read	Springhurst Ronald's Duchess	,,	,,	495
S. C. Handley	Barrowby Rosemary	,,	,,	494
T. M. Noble and Sons	Finchley Master's Bluebell	,,	,,	473

* Milked 3 times daily.



Some leading cows: 1. Mr. R. H. Mitchell's mature Jersey "Clifford Farm Gladstone", 718 lb. butter fat; 2. Mr. W. J. Wade's "Inverbroom Ruby's Marie", 508 lb. as a junior two-year-old; 3. Banyule Tiddlewinks 26th, 511 lb. butter-fat as a junior two-year-old; 4. Mr. R. M. Chirnside's mature Jersey "Werribee Mimi", 644 lb. butter-fat; 5. "Werribee Princess Satisfaction", 643 lb. butter-fat as a mature cow; 6. Mr. W. R Smith's mature Friesian, 662 lb. butter-fat; 7. "Lucerne Vale Master's Queen 2nd" (Mr. N. C. De La Rue), 609 lb. butter-fat; 8. Mr. J. H. Goddard's mature Ayrshire "Donside Thistledown 2nd", 649 lb. butter-fat; 9. "Glenloth View Dekol", (Salesian College) 683 lb. butter-fat; 10. "Braemore Princess Domino 7th"—also a Salesian College Friesian, 612 lb. butter-fat as a junior four-year-old; 11. Mr. R. H. Mitchell's "Clifford Farm Lillas", 629 lb. butter-fat; 12. Messrs. G. & M. Daley's "Belgonia Eileen 2nd", 696 lb. butter-fat.

"Maxon Noble Goldfinch 2nd" is a member of the very large herd of Messrs G. A. McNabb and Son of Irrewillipe East. This cow is bred off two prominent and long-time tested herds. Her sire comes from this year's reserve champion herd; while her dam was "Grangelea Goldfinch 3rd." The 582 lb. record of "Goldfinch 2nd," and the 735 lb. record of "Maxon Countess Light," were made without the assistance of irrigation, and in a large machine-milked herd.

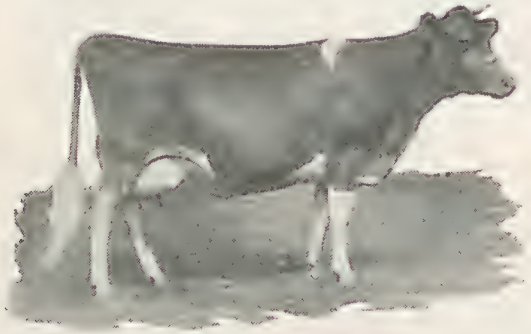
Messrs. T. M. Noble and Sons have three representatives in these classes, viz.:—"Finchley Bluebell" (576 lb. butter-fat), third in the senior four-year old; "Finchley Nasturtium 5th," (556 lb. butter-fat), class leader of the

junior three-year-old; and "Finchley Master's Bluebell," a 473 lb. junior two-year-old. The first two cows are daughters of the extensively proven sire "Werribee Lord Burnham"; while the latter is by "Finchley Masterman"—one of his proven sons.

"Myrtle Point Songstress" (604 lb. butter-fat) and "Elm Grove Silvermine" (593 lb.)—two high producers in Messrs. R. G. Gay and Son's "Elm Grove" Jersey stud.

Mr. F. W. Clarke's "Mer Vue Sister," the junior four-year-old leader, is a remarkably consistent performer, for she has been a class leader in each of the past three years. Beginning as a junior two-year-old with 496 lb. butter-fat, she followed with a yield of 629 lb. as junior three-year-old, while on this occasion she has produced 662 lb. butter-fat. Two Friesians which were milked three times a day appear in the junior four-year-old class. They are Mr. C. S. Walker's cow from Swan Hill, with 618 lb. butter-fat, and the Salesian College representative "Braemore Princess Domino" with a yield of 612 lb. butter-fat.

Messrs. J. E. Handbury and Son own the leading senior three-year-old in "Tooravale Bettws-y-Coed" with a record of 542 lb. butter-fat. This stud has another consistent performer in "Tooravale Princess 18th." She first came into prominence by winning the senior two-year-old class with a 503 lb. yield. She appeared again last year among the senior three-year-olds with 524 lb.; while, on this occasion, her 575 lb. yield secures fourth place among the senior four-year-olds. She is a worthy representative of the well-known "Princess" family. The "Taranah" stud of Mr. C. W. Macauley has two splendid young cows in the senior three-year-old section, in "Radiance 2nd" and "Rainbow 2nd". Their respective yields are 527 and 515 lb. butter-fat.



Captain A. E. T. Payne's mature Guernsey "Clara's Fashion 7th" (Imp.)—663 lb. butter-fat.

The reserve champion herd gains three places in these lists with "Avalon Starbright Duchess 2nd" (551 lb. butter-fat as a senior four), and "Avalon Starbright Pansy 4th" (552 lb. butter-fat as a senior three), both being daughters of "Brucevale Lord Starbright 3rd," the sire of many fine performers in the "Avalon" herd. "Avalon Madeira Pansy" (526 yb. butter-fat, as a junior three-year-old) is the third representative of this stud. She is a daughter of "Mornmoot Prince Madeira," whose sire left many great producers in the "Mornmoot" herd of Mr. R. M. Chirnside.

No fewer than three "Madeiras" represent the champion herd in the junior class lists. They are "Mornmoot Princess Madeira 9th" (551 lb. butter-fat), "Mornmoot Princess Madeira 6th" (544 lb.) (junior three-year-olds), and "Mornmoot Princess Madeira 7th" (589 lb. butter-fat as a senior two). The latter is a daughter of the famous test cow "Princess Madeira," who was twice champion and once reserve champion, and is the highest producing cow on the Advanced Register. A very precocious young cow is "Mornmoot Mimi." Calving twice before she was three years old, she has yielded 957 lb. butter-fat, her last record of 542 lb. being made as a senior two-year-old.

The "Springhurst" stud has three heifers in the two-year-old classes. Third place in the senior class is occupied by "S. Ronald's Alsyke" with a yield of 545 lb. butter-fat, while a herd-mate in "S. Blonde Nightshade" is sixth with 496 lb. butter-fat. Each of these

cows represents a very famous "Springhurst" family. With a 495 lb. yield "S. Ronald's Duchess" is fourth among the junior two-year-olds.

The leader in the senior two-year-old class is Mr. J. H. Goddard's very efficient young Ayrshire cow "Inverurie Bluebell." Her yield of 602 lb. butter-fat also secures for her the age-record for the breed. She began her test career with a yield of 515 lb. butter-fat, which is also an age record for the breed. Her breeding has been influenced by those two well-known cows "Thistledown 2nd" and "Lydo Lady."

The class leader in the junior two-year-old section is "Yarraview Benefactoress"—a daughter of "Clara's Fashion" Imp. As was the case last year when "Yarraview Le Mode" won this section, the yield was considerably over 500 lb. The 521 lb. record of "Benefactoress" is more than 100 lb. higher than that of her dam at the same age.

Mr. G. A. Fraser's "Bonnie Doon Honey"—631 lb. butter-fat.

Mr. F. W. Clarke's "Mer Vue Sister"—leading junior four-year-old.—(662 lb. butter-fat).

"Pine Ridge Lady" (502 lb. butter-fat) brings a new stud into the junior classes. She is owned by Messrs. Nancarrow Bros. of Kerang, and is one of the many good daughters of the proven bull "Duke of the Lake," Imp. "Banyule Tiddlewinks 26th" (511 lb.), Mr. S. C. Handley's "Barrowby Rosemary" (494 lb.), and Mr. W. J. Wade's "Inverbroom Ruby's Marie" (508 lb), are all very prominent performers in the junior two-year-old section.

It can be said of the majority of these cows that they have demonstrated real dairy ability. When good records are made, it can also be inferred that such cows enjoyed good conditions of health, feed and management throughout the test period. High individual records, however, do not necessarily indicate a really great cow. On the other hand, a perusal of the annual reports will indicate many really great individuals who have never exceeded the 500 lb. butter-fat level.

(Herd Averages on page 446.)

Watering Horses

Whenever possible, water troughs, which must be regularly cleaned, should be used for watering horses. Naturally the purer the water supply the better it is for the animal.

On many farms animals are allowed to water at a water-hole or dam. This is a bad practice as they pollute the water and puddle up the sides of the dam. Care should be taken to see that the catchments supplying dams, &c., are free from contamination.

Whenever possible, horses should be watered before feeding. As soon as the horses are unyoked, allow them to have as much water as they want. Do this even if the animals are hot, and then let a little time elapse before allowing them to feed. Sometimes before the early morning feed, especially in the winter, horses will not drink before eating. They may then be allowed to drink about half an hour after they have finished eating. In some stables water is provided in the stalls, and the horse drinks whenever he likes; this system is quite good.

Herd Averages, 1939-40

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average without Allowances.	Average with Allowances.
		No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.	Average.	No.		
HERDS OF 25 COWS AND OVER.																		
1. Chirnside, R. M.	Jersey ..	9	347·8	4	497·9	4	510·4	..	..	1	480·1	2	529·8	9	578·5	29	480·9	552·7
2. Payne, A. E. T.	Guernsey	12	361·4	2	426·0	5	458·9	2	475·9	..	..	2	441·0	10	558·6	33	451·7	527·4
3. Read, Estate of late J. D.	Jersey ..	10	329·1	5	437·1	2	430·7	1	375·4	3	444·7	1	513·3	10	421·3	32	399·2	472·1
4. McNabb, G. A. and Son	„ ..	6	319·2	3	339·6	1	488·2	6	386·4	6	407·1	7	441·1	15	460·0	44	413·0	469·3
5. Hore, E. ..	„ ..	9	320·5	7	352·8	..	..	2	424·4	3	382·6	3	411·5	10	445·6	34	383·6	454·3
6. Hurrey, Estate of late W. H.	„ ..	9	305·3	..	..	4	347·0	2	439·5	4	381·1	1	435·4	7	413·0	27	365·4	434·3
7. Ballarat Orphanage	„ ..	2	346·4	4	374·1	2	388·2	4	354·8	2	374·8	..	..	14	398·8	28	382·8	429·3
8. Norman, J. G. ..	„ ..	8	283·9	1	365·5	3	359·6	5	376·9	3	393·2	1	435·1	4	392·9	25	351·5	426·1
9. Atkinson, W. K.	Dairy Shorthorn	15	288·4	6	345·2	9	311·0	7	316·7	6	334·2	7	332·8	21	396·2	71	339·0	422·2
10. Walker, C. S. ..	Jersey ..	8	304·0	4	327·5	2	336·9	1	472·7	4	340·0	1	419·8	7	386·5	27	347·2	418·4
11. Department of Agriculture	Red Poll	8	303·9	12	284·8	4	284·9	6	337·5	3	396·0	1	406·5	22	369·0	56	334·4	408·1
12. Smith Bros. ..	Jersey ..	6	292·1	5	319·9	3	368·9	3	374·3	..	..	3	360·6	19	370·8	39	350·5	406·1
13. Maher, R. H. ..	„ ..	1	206·5	9	291·2	..	..	8	291·9	1	334·8	2	360·0	8	310·4	29	300·0	361·5
HERDS OF 15 TO 24 COWS.																		
1. Austin, F. ..	Jersey ..	5	377·0	2	430·3	1	526·3	3	488·1	1	526·0	3	541·5	3	517·3	18	468·8	534·7
2. Salesian College	Friesian..	1	385·6	2	366·4	1	333·8	..	..	1	612·3	..	..	10	515·5	15	481·3	510·7
3. Powell, T. S. ..	Jersey ..	3	416·3	..	..	3	445·2	1	486·6	1	464·0	2	377·8	6	507·2	16	458·4	505·1
4. Noble, T. M. and Sons	„ ..	4	396·1	3	434·4	3	509·2	..	..	2	456·0	1	575·9	11	446·6	24	450·7	501·8
5. Handbury, J. E. and Son	„ ..	5	335·4	1	432·2	3	386·8	1	542·0	..	..	2	482·7	3	442·8	15	407·0	473·4
6. Fraser, G. A. ..	Ayrshire	3	335·7	2	347·5	2	290·1	4	348·3	2	469·8	..	..	6	557·2	19	418·8	475·6
7. Broad, Mrs. A. A.	Jersey ..	8	345·8	3	364·8	2	451·0	1	332·0	..	..	..	..	3	470·7	17	382·8	470·8
8. Fairchild and Clutterbuck	„ ..	9	364·7	2	338·8	2	358·0	..	..	1	381·5	1	429·0	2	375·4	17	366·9	456·1
9. Vaughan Bros...	„ ..	5	322·9	1	353·6	2	330·3	1	346·9	..	..	1	465·1	5	465·4	15	384·5	447·2
10. Department of Agriculture	Friesian..	6	302·0	3	296·4	2	353·3	1	303·9	1	402·0	1	346·8	7	488·4	21	375·2	440·1
11. Nicholas, M. A.	Jersey ..	7	369·2	..	..	4	340·0	..	..	4	361·4	..	..	4	378·8	19	363·4	434·9
12. Haywood, Dr. A. R.	„ ..	12	317·8	..	..	4	346·9	2	298·6	..	..	1	455·8	3	427·9	22	342·6	432·5
13. Colenso, L. W. R.	„ ..	8	283·5	2	254·1	2	416·2	2	411·9	1	478·4	1	405·6	8	387·7	24	350·7	417·7
14. Alston, Mrs. N. B. and Sons	„ ..	2	268·7	..	..	2	358·5	3	359·1	2	336·4	2	469·8	8	400·3	19	376·1	415·0
15. Wade, W. J. ..	„ ..	2	352·9	3	279·2	1	343·6	1	438·2	5	357·0	1	383·4	5	405·5	18	362·3	413·8
16. Daley, G. and M.	„ ..	6	283·0	3	374·1	4	309·6	..	..	1	255·3	..	..	7	413·5	21	343·3	412·0
17. Vagg, E. J. ..	„ ..	8	301·7	4	307·1	..	..	1	448·6	1	339·2	..	..	5	378·0	19	332·6	411·5
18. Shearman, A. and W.	„ ..	3	295·7	..	..	5	312·5	1	289·3	1	490·0	2	368·1	5	403·0	17	351·8	405·7
19. Crawford, Mrs. E.	„ ..	8	260·1	1	347·3	3	371·2	..	..	4	328·9	..	..	4	415·2	20	325·9	401·4
20. Trevaskis, F. T.	„ ..	4	281·1	2	315·5	1	303·0	1	407·3	2	356·1	1	279·0	5	400·5	16	341·2	399·2
21. Tomasetti, B. G.	Ayrshire	4	289·4	..	..	3	369·1	..	..	1	337·6	..	..	8	375·5	16	350·4	398·4
22. Harvey, T. ..	Jersey ..	6	275·6	4	305·0	1	256·6	..	..	1	395·2	2	337·9	6	355·9	20	316·8	383·3
23. Coulthard, J. L. and Son	„ ..	6	264·8	2	310·8	1	290·4	2	321·4	1	205·7	1	421·9	3	333·1	16	298·2	372·4
24. McErvale, I. and Sons	„ ..	1	229·2	2	300·4	1	356·2	..	..	2	315·6	..	..	9	329·5	15	318·9	350·9
HERDS OF 10 TO 14 COWS.																		
1. Goddard, J. H.	Ayrshire	2	392·6	1	601·9	2	269·5	..	..	1	429·6	..	..	5	569·6	11	473·1	522·2
2. Williams, F. A.	Jersey ..	..	..	2	386·6	..	..	1	471·9	2	417·8	1	634·4	5	517·7	11	482·2	514·9
3. Enders, N. H. ..	„ ..	5	397·9	1	446·9	1	381·8	1	453·3	1	405·9	1	531·8	3	512·6	13	442·1	511·3
4. Maloney, P. J...	„ ..	3	396·6	3	434·9	1	316·4	1	460·3	2	543·9	..	..	2	442·2	12	436·9	510·3
5. Mitchell, R. H.	„ ..	1	359·3	1	316·9	2	417·6	..	..	1	522·9	..	..	7	510·4	12	467·2	502·2
6. Gay, R. G. and Son	„ ..	2	336·8	..	..	..	..	..	..	1	484·5	1	415·8	6	521·4	10	470·2	500·2
7. Lyon, C. G. ..	„ ..	7	368·6	1	327·1	1	377·4	..	..	1	426·0	..	..	..	..	10	371·1	477·1
8. Macauley, C. W.	„ ..	5	331·3	1	415·5	1	383·7	4	454·8	..	..	1	521·1	2	391·2	14	398·5	472·7
9. Masters, S. H. and Son	„ ..	4	346·7	..	..	1	438·0	..	..	2	491·1	..	..	4	431·9	11	412·2	470·4
10. Fixter, A. ..	Guernsey	4	323·8	..	..	1	394·8	..	..	..	..	..	..	6	469·8	11	409·9	460·8
11. Smith, R. W. ..	Friesian..	6	318·2	1	261·7	..	..	1	401·7	..	..	2	436·2	2	549·1	12	378·6	455·3
12. Dookie College ..	Ayrshire	..	..	2	309·6	2	324·7	1	299·9	3	411·1	..	..	3	471·6	11	383·3	432·4
13. Calf, A. J. ..	Jersey ..	2	316·6	..	..	2	390·4	1	416·1	..	..	2	417·8	5	402·6	12	389·9	431·6
14. Huffer, J. A. ..	„ ..	6	323·6	1	286·7	1	303·4	..	..	1	399·3	1	386·9	3	432·4	13	355·0	428·0
15. O'Neill, J. ..	„ ..	2	320·0	3	353·2	1	358·1	..	..	1	312·3	1	450·3	2	391·4	10	360·3	428·3
16. Richardson, W. S.	„ ..	1	215·5	1	225·7	2	296·1	1	419·1	1	321·3	..	..	6	418·8	12	357·2	397·2
17. Black, Estate of late I. S.	Ayrshire	1	248·8	1	392·2	2	375·7	2	363·7	1	146·0	2	340·2	3	327·1	12	327·8	375·6
18. Hore, M. T. ..	Friesian..	1	153·1	..	..	..	..	3	368·6	2	348·7	2	322·4	6	357·7	14	339·1	369·1
19. Butcher, F. T...	Red Poll	3	232·8	3	314·6	1	301·6	1	408·7	1	236·9	2	347·9	2	315·4	13	301·2	368·9
20. Pattison, F. ..	Ayrshire	1	322·3	..	..	1	290·4	..	..	1	392·6	2	306·7	7	350·8	12	339·6	362·9

Garden Notes

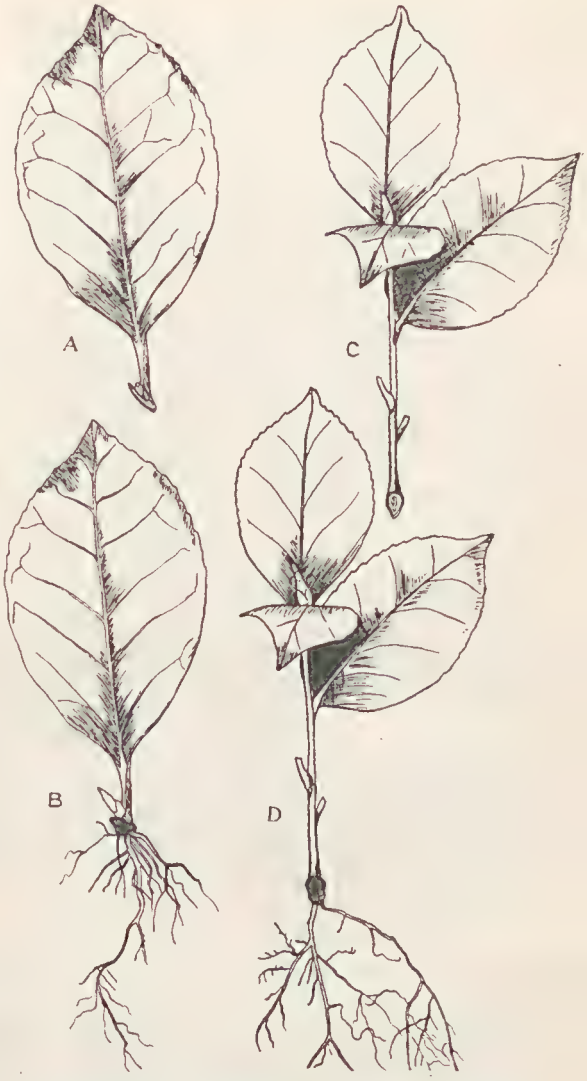
By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed.,
Principal, School of Horticulture, Burnley

WITH the advent of spring, the work in the garden becomes more interesting. If a fine grass lawn is to be planted, it should be sown as soon as possible to give it a reasonable chance to become established before the hot weather arrives. If buffalo or couch is chosen, November is the most suitable time for planting. As soon as the flowering peaches, plums and apricots have finished flowering, they should be cut back hard to encourage long growths on which next year's flowering will take place. The flowering apples and cherries require very little pruning except to keep them in good shape. They flower on the old wood.

Any of the following seeds can be sown during September:—aster, antirrhinum, carnation, delphinium, dianthus, gaillardia, geum, lupin, petunia, marigold, phlox, scabious, and larkspur. Plant out such perennials as canna, agapanthus, pentstemon, begonias, perennial asters and phlox, rudbeckia and such like.

This is also a good time to plant evergreen shrubs, particularly those that may be frost tender in the young stage. There are shrubs which are suitable for almost any position and any type of soil. Shrubs which grow well in sheltered positions in moist soils include the azalea, hydrangea, camellia, kalmia, magnolia, clethra arborea, andromeda, daphne, and fuchsia.

One of the old favourites that is regaining its lost popularity is the camellia, and some of the older varieties are holding their own with the newer ones. The camellia requires a little shelter from the summer sun, so that a sheltered south-easterly aspect is very suitable for it. It requires a soil that is well drained, but one that retains a reasonable amount of moisture, such as one rich in organic matter and free from lime. Similar to the rhododendron, it prefers a cool moist position for its roots and in the summer, the soil should not be allowed to get dry. In the spring, give it a good mulching with old cow manure or leaf mould.



Propagating Camellias. A.—Camellia bud cutting, showing bud in axil of leaf. B.—A rooted bud cutting. The bud develops very slowly. C.—A prepared camellia cutting. D.—A cutting 6 months after insertion in sand.

Some camellias propagate easily, but others are rather difficult. They are mainly propagated as follows:—

Budding or Grafting.—Plant camellia seeds as soon as they are ripe, and when the plants are old enough, work the desired variety on to the seedling either by budding or grafting.

Layering.—Select a suitable branch and make a slit where it is desired to root it, and peg it to the ground. Cover with some good soil. Layer in the spring and leave it for twelve

months before severing from the parent plant. The following autumn, i.e., eighteen months after layering, lift and plant it in its permanent position.

Cutting.—There are two methods by which camellias may be propagated by cuttings; (i) leaf or bud cuttings, and (ii) stem cuttings. A leaf or bud cutting is made from a half-ripened bud in its axil, together with a small shaving of the stem. This is inserted in sand and in about six months, it should be well established and ready to be potted on. When propagating by stem cuttings, select young growth about four to six inches long and remove all but the top leaf or two. Make the cuttings in the autumn and place them in sand in a warm position with a bell jar over them.

Inarching.—This is sometimes carried out when cuttings are difficult to strike as for example, *Camellia reticulata.* In this way, camellia seedlings may be grown in pots and placed alongside the mature plant in close contact with the branch to be inarched. Cut both the stock and the desired branch in a manner similar to that for side grafting, and bind with raffia and grafting wax. When the union has taken place, the branch is severed from the plant and becomes dependent on the stock plant.

Camellia Varieties.

Some of the popular camellia varieties include—

Camellia reticulata.—Unfortunately, this variety is difficult to propagate and is not a vigorous grower. It has large semi-double pink flowers which are the most beautiful of all, but plants are difficult to obtain and are very expensive.

Camellia, The Czar.—This camellia has large single carmine-rose flowers with a mass of golden stamens in the centre and is the most popular variety.

Camellia sasanqua.—A smaller variety with a good deal of variation in regard to colour and type of flower.

Camellia japonica.—This consists of many choice varieties, varying in colour of flowers from white to very dark red, and sometimes having variations of colour on the same bush. Red Waratah, Lady Parker, Edward Billing, and Isabella are four good reliable types.

Vegetables.

During this month, the weeds will be commencing to develop and it is important to run the Dutch hoe between the rows of growing vegetables not only to destroy the weeds, but also to keep the surface soil open to enable the warmer air to penetrate and warm up the soil.

Make sowings of lettuce, vegetable peas, radish, turnip, parsnip, and an early sowing of French beans. Plant out asparagus and rhubarb crowns, and prepare the area for cucumber, tomato, pumpkin, melon and squash. These may be sown as soon as the danger of frosts has passed, which is usually September in northern Victoria, and October in the south.

The pumpkin family provides some very useful vegetables, including the squash, pumpkin, and vegetable marrow. These three vegetables require much the same treatment. They do best in a warm position, and as long as the soil is well drained and contains plenty of organic matter, they will thrive if given a liberal supply of water.

Pumpkin seeds are usually planted in twos or threes, about 8 feet apart in the rows and 8 feet between the rows. They are mostly consumed in the cooler months of the year and are not used until mature. When mature, the outer skin is quite hard and they may be left on the vine until it begins to die back. They should be harvested without bruising and with the stalk left on, and if protected from the weather, may be stored for months.

A good pumpkin is one that has a fine grain and, when cooked, has somewhat the appearance of a boiled yoke of egg. Some of the best culinary pumpkins are:—The Crown, Ironbark, Triamble, and Turk's Cap. Good squashes include Blue, Green, and Golden Hubbard.

The vegetable marrows are of two types.—(*a*) the bush and (*b*) the running type. The bush ones are planted 4 feet between the seeds and 4 feet between the rows, and the running ones about 6 feet both ways. These are eaten in the immature stage, and if allowed to ripen lose their flavour. They do not store well. Good varieties of these include.—Early Long Green, Early Long White, and Custard as bush types, and Long Green Running, Long White Running, and Marblehead of the running types.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

THE lack of rain during the winter is causing some concern amongst orchardists, because a very dry soil may retard early growth and blossoming of the trees and will almost certainly reduce the vigour of the blossoming and affect the setting. Many citrus growers have already applied a winter irrigation and expect another one early this month. Unless good rains fall, irrigation should be applied.

Growers frequently hesitate to apply water in the spring because of the possibilities of good spring rains, but the present season has been so dry that it would be advisable to apply a light watering. It is particularly necessary where cover crops have made rather vigorous growth and have depleted the soil moisture. If a light irrigation is given to the trees, it would be a good plan to supply quickly soluble nitrogenous fertilizer at the same time. In this way, the supply of nitrogen to the trees at the fruit-setting period will be assured.

It will be necessary to apply nitrogenous fertilizers to those stone fruit orchards which did not receive an application last month. The quantity per tree may be as high as 4 lb. of sulphate of ammonia or its equivalent in some form of organic manure. On the light soil types 5 to 6 lb. of complete fertilizer per tree is a useful manure.

In the near future, many apple and pear varieties may have to be excluded from the markets, or if allowed to be marketed, the returns are likely to be so low that they will become definitely uncommercial. Some growers have already anticipated this trend and have reworked these obsolete varieties to more profitable ones. The present season provides an excellent opportunity for this reworking to be carried forward on a much more elaborate scale, and growers are urged to consider this very necessary operation. In any proposed reworking programme, preference should be given to the following varieties which have characteristics likely to maintain their place in Victorian horticulture. Of course, some of the varieties included below are suitable for restricted districts only, and growers will distinguish between the suitable and unsuitable types:—Jonathan, Rome Beauty (including Red Rome, Glengyle Red, Rome Seedlings), Granny Smith, Yates, Delicious (including Lalla and Red Delicious), Gravenstein, Democrat (Syn. Tasma), Statesman (including Chandler and Warrior), Cleopatra (Syn. New York Pippin), and Crofton.

For special early markets, the following five varieties may be increased to a limited extent:—William's Favourite, Twenty Ounce, Lord Nelson, and Willie Sharp.

In Victoria, there are more than 158 varieties of apples grown and eleven of the chief varieties constitute about 90 per cent. of the total number of trees, leaving the remaining 147 to make up the balance of the trees. This position should be rectified as early as possible by the elimination of the majority of these 147 varieties, and growers are urged to do as much reworking this spring as possible.

In reworking pear trees, preference to the following varieties should be given for reworking on obsolete or undesirable varieties:—Josephine, Packham's Triumph, Winter Cole, Winter Nelis, Doyenné du Comice, and, of course, for canning, W.B.C.

Growers who decide to do any reworking, may contact the orchard supervisors stationed in the various country districts, or, in the case where growers have difficulty in locating the orchard supervisor, requests can be addressed to the Superintendent of Horticulture, Department of Agriculture, Melbourne, C.2.

Early in September, the first application of Bordeaux mixture 6:4:40 spray for the control of black spot of pears should be made when the pear trees have reached the delayed "green-tip" stage in their growth. Packham's Triumph and Winter Nelis varieties are usually ready for this spray about the first week in September, and are followed by Josephine and B. Bosc, and later by Williams. It is customary to spray Josephine and Winter Cole at a slightly earlier "green-tip" stage than the other varieties. The correct "green-tip" stage is recognized when the maximum number of blossom buds has the brown scales (bracts) separating, and the tips of the green folded leaves are just visible.

Later in the month, about eight to twelve days after the first spray, the second 6:4:40 Bordeaux mixture can be applied to all varieties except Josephine. This spray is applied at the "finger" stage, and for Winter Nelis and Madam Cole the application must

be applied before any petals show pink, otherwise severe russetting may occur. The "finger" stage is recognized when the green leaves are separated from the clustered blossom buds which are just beginning to separate, but the white petals have not yet appeared.

Citrus growers should carry out an inspection of their trees for any signs of collar rot, anthracnose or septoria. It is a good practice where these diseases are prevalent to apply a 3:3:50 Bordeaux mixture with three-quarters of a gallon of white oil added, during September. This spray not only assists in the control of leaf and fruit-spotting fungus but also helps in reducing the incidence of black pit and brown rot of citrus.

The treatment for collar rot includes the careful removal of all diseased areas on the trunk, cutting away infected wood until a clean surface is reached, and painting the wounds immediately with a mixture made of equal parts of bluestone and slaked lime with sufficient water to make a paste. Pruning the skirt of the tree that is in contact with the soil and removing the tall weeds which may keep the trunks of the trees moist, also assist in controlling this trouble as well as brown rot. Care should be taken to collect all infected chips, and implements used in cutting the bark should be sterilized by dipping in a formalin solution (1 in 40).

After the Navel orange crop has been harvested, essential pruning work can be carried out. This will include the removal of dead wood from the centre of the tree and also the removal of water-shoots, which are not required in frame work construction, and limbs interfering with normal cultivation. In the bearing brush wood, dying twigs and dead fruiting brushes may be removed with a view to stimulating the fruit bearing wood during the coming season. The pruning of Valencia late oranges can be delayed until after harvesting.

Live Stock Notes—*Continued from page 437.*

dry mash always available, and to feed a wet mash twice a day. At the end of three weeks, the wet mash can be fed once a day. After the birds are a few days old, a little finely chopped tender green food should be added to the wet mash, and some may be fed separately.

As with chickens, the young turkeys should be allowed free range in fine sunny weather. It is important that they be kept dry, as they are very susceptible to the ill effects of wet and damp conditions.

Skim milk may be used in mixing the mash, and also for drinking purposes. A little cracked grain should also be fed in the evenings, and at the end of six weeks, whole wheat and oats, with cracked maize, if available, may be given. It is important that an adequate supply of fresh green food, shell grit, charcoal, and clean drinking water should always be available for the birds right up to the time of marketing.

When the birds are allowed out on free range, with plenty of grass seeds and insect life available, the mash may be eliminated, and a grain feed given in the evening only to encourage the birds to come back to the roosting quarters, and also to supply any additional food that may be required. Extra food should be fed to the birds for three or four weeks before marketing, to ensure that they are in prime condition.

Turkeys are very prone to disease, and strict sanitary conditions are essential for success. (H. F. Clinton, Poultry Expert.)

Bees.

No time should now be lost in completing repairs to hives, supers, and frames, because breeding will be in full swing and, as soon as swarming commences, there will not be time to set up new boxes, repair supers or re-wire frames ready for putting in the wax foundations, &c. The actual fitting of the foundations is not advised until the bees are ready to use them, otherwise they may be damaged while being stored.

All hives should again be inspected and the strength of the colonies noted so that the weaker colonies can be strengthened by introducing new swarms into them. New swarms may be taken and held in temporary boxes and united to the weaker colonies in the evening. Provided that there are sufficient bees in the weaker colonies to cover any introduced brood comb, the colonies can be strengthened by introducing frames of emerging brood from stronger hives. If it is intended to increase the size of the apiary, it should be done during swarming, but otherwise the new bees should be used to strengthen the existing hives.
(J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.)

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test.)

For greater facility of reference, cows are grouped according to breed, the order of cows within the group being according to yield. The minimum yield is an equivalent of 400 lb. butter-fat per cow over four consecutive years of test. In arriving at the equivalent, allowances are credited to immature animals as follows:—

Two-year-olds receive 30 per cent.; three-year-olds receive 20 per cent.; and four-year-olds receive 10 per cent. allowance.

In the life-time section, where the total number of records to date are considered, it may be inferred that the cow has calved regularly since calving first as a two-year-old—when three junior records are indicated—where four are shown, it is evident that first calving occurred at a very early age.

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
AYRSHIRES.										
Donside Lydo Lady (23657) ..	628	16.10.29	1	5	748	12,838	598	Olivedale Chum (6341) ..	Donside Loco Lady (23656)	J. H. Goddard
Bonnie Doon Snowdrop (23467) ..	521	3.11.31	3	2	555	10,106	465	Blair Athol Dream Boy (6556)	Craigielea Sylvia (17686)	G. A. Fraser
Donside Thistledown 2nd (23662) ..	515	29.9.29	1	4	649	11,234	492	Olivedale Chum (6341) ..	Donside Thistledown (23661)	J. H. Goddard
Glencorren Violetta (20120) ..	485	27.7.28	3	5	506	9,896	407	Glen Athol Jimmie (6211)	Glen Athol Violet (13652)	B. G. Tomasetti
Glencorren Viola (21508) ..	480	10.7.29	3	5	511	9,080	411	Scotswood Michael 2nd (7026)	Glen Athol Violet (13652)	,, ,,
Glencorren Foam (21505) ..	477	7.8.29	3	4	481	8,538	423	Glen Athol Brilliant (6729)	Glen Athol Fashionable (12242)	,, ,,
Dookie Flora (17776)	449	24.4.26	2	7	485	9,723	424	Majestic of Burwood (4126)	Scotswood Mistletoe (10309)	Dookie Agric. College
Dookie Lilac (27119)	445	27.2.32	3	2	450	9,855	376	Dookie Emblem (8061) ..	Dookie Lily (23669) ..	,, ,,
Leithvale Phyllis (23086) ..	428	15.9.29	3	3	412	7,457	357	Gleneira Grantian (5773)	Gleneira Gracie (20170) ..	B. G. Tomasetti ,,
Carracoorte Brownie's Belle (23547)	419	19.8.29	3	3	483	6,765	364	Carracoorte Gerty's Producer (5502)	Carracoorte Brownie (13604)	W. Henderson
Carracoorte Briar Bud (23546) ..	412	29.6.29	3	3	451	7,299	341	Carracoorte Lochiel (6596)	Carracoorte Sweet Briar (17480)	,, ,,
FRIESIANS.										
Victoria Belfry (5104)	541	26.5.34	3	1	557	12,918	476	Victoria Joyous Mercedes (985)	Victoria Tinkle Bell (3266)	State Research Farm
Victoria Quilt (3767)	520	26.2.29	3	4	586	12,141	492	Victoria Top Note (674) ..	Victoria Patchwork (1706)	
Greenvale Segis Patch (3495) ..	500	24.11.28	1	4	637	14,324	486	Lydholm Segis Paxton (386)	Burnbank Spring Patch (1819)	M. T. Hore ,, ,,
Victoria Songstress (3768) ..	483	23.8.29	2	4	526	14,691	452	Victoria Joyous Mercedes (985)	Victoria Songbelle (1708)	State Research Farm
Victoria Woodcrest Daisy (5112) ..	472	24.10.32	3	2	536	11,488	415	Victoria Joyous Mercedes (985)	Victoria Songbelle (1708) ..	,, ,, ,,
Warwick Maggie Woodcrest ..	459	28.2.33	3	1	636	13,189	412	Greenvale Woodcrest Oakwood 2nd	Burnbank Maggie Alcartra	C. S. Walker

ADVANCED REGISTER OF MERIT FOR STANDARD HERD TEST. (273 DAY PERIOD OF TEST)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
DAIRY SHORTHORNS.										
Willow Park Dainty 5th (1254E) ..	544	12.8.30	3	4	546	11,494	472	Willow Park Banker 2nd (560F)	Willow Park Dainty 3rd (1252E)	W. K. Atkinson
Willow Park Melba 15th (1315E)	500	22.3.33	3	1	460	9,691	436	Willow Park Lustre 3rd (620F)	Willow Park Cherry (1227E)	,, ,,
Willow Park Damsel 3rd (1264E) ..	499	3.9.32	3	2	470	10,198	434	Willow Park Imperial 3rd (613F)	Willow Park Damsel 2nd (1263E)	,, ,,
Willow Park Damsel 2nd (1263E)..	492	7.10.26	3	5	542	10,906	480	Willow Park Reflector (629F)	Willow Park Damsel (1262E)	,, ,,
Willow Park Countess 9th (1244E)	483	30.8.30	2	4	489	11,037	454	Willow Park Imperial 2nd (612F)	Willow Park Countess 4th (1240E)	,, ,,
Willow Park Countess 10th (1245E)	480	17.2.31	3	3	524	11,065	432	Willow Park Reflector (629F)	Willow Park Countess (1237E)	,, ,,
Drumneil Lily (775E)	472	17.10.32	2	2	530	11,681	466	Willow Park Reformer (253F)	Drumneil Queenie (785E)	Meaklim Bros.
Willow Park Comet 7th (1231E) ..	467	12.12.29	3	4	497	11,386	423	Willow Park Design (579F)	Willow Park Comet 2nd (1228E)	W. K. Atkinson
Willow Park Melba 11th (1311E)	457	20.8.32	4	1	481	10,132	402	Willow Park Imperial 3rd (613F)	Willow Park Melba 6th (1306E)	,, ,,
Drumneil Nellie 3rd (779E) ..	457	21.2.33	3	2	454	10,856	391	Willow Park Reformer (253F)	Drumneil Nellie (777E) ..	Meaklim Bros.
Willow Park Moss Rose 3rd (1324E)	446	6.2.28	3	5	490	11,140	404	Willow Park Reflector (629F)	Willow Park Moss Rose (1322E)	W. K. Atkinson
Willow Park Duchess 26th (1286E)	432	16.9.33	3	1	430	8,914	381	Willow Park Imperial 3rd (613F)	Willow Park Duchess 7th (1268E)	,, ,,
Willow Park Comet 9th (1233E) ..	431	3.4.32	3	1	406	9,335	377	Willow Park Imperial 3rd (613F)	Willow Park Comet 2nd (1228E)	,, ,,
Willow Park Camelia 9th (1219E)	430	30.5.32	3	2	400	8,710	362	Willow Park Imperial 3rd (613F)	Willow Park Camelia 2nd (1212E)	,, ,,
Drumneil Queenie (785E) ..	430	27.9.24	..	5	461	10,273	429	Willow Park Rosemont (256F)	Willow Park Queenie 9th	Meaklim Bros.
Drumneil Roany 2nd (788E) ..	427	10.10.31	2	2	434	9,192	398	Willow Park Reformer (253F)	Drumneil Roany (787E)	,, ,,
Willow Park Melba 22nd (1321E)	423	3.9.34	3	1	408	9,687	370	Willow Park Lustre 3rd (620F)	Willow Park Melba 11th (1311E)	W. K. Atkinson
Willow Park Dainty 4th (1253E) ..	414	18.12.29	3	4	447	5,252	392	Willow Park Eminent (249F)	Willow Park Dainty 2nd (1251E)	,, ,,
Willow Park Duchess 7th (1268E) ..	409	7.10.25	3	7	443	8,588	362	Willow Park Count (383E)	Willow Park Duchess (196F)	,, ,,
GUERNSEYS.										
Clara's Fashion 7th (Imp.) (6652) ..	563	26.12.32	3	1	663	10,422	499	Sunrise of Maple Lodge ..	Clara's Fashion ..	A. E. T. Payne
Yarraview Delight (5167) ..	480	25.8.32	2	2	486	8,739	448	Camelia's Majestic of Maple Lodge	Clara 2nd of Maple Lodge	,, ,,
Avonview Dulcie (2537)	449	3.1.30	4	4	481	6,840	487	Melbourne Sandboy 6th ..	Fernleigh Daphne ..	A. Fixter
Fernleigh Rosebud (2681) ..	422	14.11.27	4	3	386	6,362	357	Werribee Jessie's Boy ..	Melbourne Rosebud (764)	,,
Fernleigh Daffodil (2679) ..	404	21.2.28	4	..	363	5,830	332	Werribee Jessie's Boy ..	Daffodil's Heiress of Maple Lodge	,,

JERSEYS.

Mornmoot Princess Madeira (37071)	810	24.2.31	4	4	704	10,825	618	Werribee Grandmaster (6052)	Werribee Princess Madeira 2nd (33143)	R. M. Chirnside
Mornmoot Princess Madeira 3rd (45269)	755	11.1.33	3	2	734	11,420	670	Staghorn Larkspur's Majestic (8683)	Mornmoot Princess Madeira (37071)	" "
Rintoul View Petal (37339) ..	695	18.9.30	4	2	624	9,571	564	Banyule Triplane (5753) ..	Relbia Lucy (15737) ..	N. H. Enders
Mornmoot Fancy Starbright (45256)	678	20.4.33	3	2	705	9,734	585	Werribee Prince Madeira (6054)	Brucevale Fancy Starbright 2nd (25802)	R. M. Chirnside
Ballara Bonnie (33911)	674	19.7.29	3	5	691	9,168	596	Brucevale Lord Fancy Madeira (7920)	Garenne 2nd of Brucevale (17719)	F. A. Williams
Springhurst Sybil Nerine (46192) ..	659	29.3.33	3	1	680	9,653	580	Bellefaire Seaborn Successor (6824)	Springhurst Nerine 2nd (26169)	J. D. Read Estate
Belgonia Eileen 2nd (42921) ..	633	15.8.32	3	2	696	10,262	585	Duke of the Lake (Imp.) (7805)	Eileen 2nd of Clarendon Eyre (13521)	G. and M. Daley
Finchley Canary 3rd (37992) ..	632	18.9.29	3	5	635	8,734	523	Werribee Lord Burnham (5760)	Canary 2nd of Listerfield (10431)	T. M. Noble and Son
Mornmoot Northwood Madeira (33142)	630	10.8.30	4	3	643	9,325	530	Werribee Prince Madeira (6054)	Brucevale Northwood Madeira 2nd (24295)	R. M. Chirnside
The Wattles Joy 3rd (46418) ..	629	23.9.32	4	1	567	9,960	506	The Wattles Biplane (8758)	The Wattles Joy (37346) ..	N. H. Enders
Mornmoot Princess Madeira 5th (49660)	626	11.12.33	4	1	571	8,280	526	Werribee Jupiter, 9047 ..	Mornmoot Princess Madeira (37071)	R. M. Chirnside
Grangelea Rose (33040)	623	27.9.29	3	4	567	9,427	480	Banyule Airo (5751) ..	Grangelea Roseleaf 2nd (26394)	Mrs. A. A. Broad
Werribee Starbright 9th (6542) ..	619	9.4.17	2	4	596	9,849	547	Island Butter King (929)..	Starbright 7th (2863) ..	W. J. Clarke
Tooravale Princess 9th (46479) ..	618	31.10.30	3	4	627	8,609	524	Tooravale Gold Speck (5446)	Princess 2nd of Strathbow (12206)	J. E. Handbury and Son
Bamawm Primrose (47102) ..	614	1.9.33	3	1	582	9,686	523	Bamawm Bonnie Boy (10343)	Wompini Rose Marie (29485)	F. A. Williams
Leven Brae Perree's Girl (34002) ..	614	10.9.29	4	3	573	8,736	494	Werribee Gay Piece (4823)	Twylish's Perree of Leven Brae (21276)	C. S. Grice
Mornmoot Clementine (41121) ..	611	6.1.32	4	1	566	8,636	512	Werribee Prince Madeira (6054)	Melrose Clementine (28551)	R. M. Chirnside
Studleigh Master's Kirsty (33077) ..	609	15.8.29	3	2	550	8,425	482	Studleigh Masterpiece (5961)	Kirsty 5th (4100) ..	A. O. Foster
The Wattles Petal (55522) ..	602	26.8.34	3	1	571	8,489	505	Banyule Supine (7998) ..	Rintoul View Petal (37339)	N. H. Enders
The Wattles Joy (37346) ..	590	29.9.29	3	1	605	10,634	514	Choice Prince of Belgonia (4414)	Arishima Joyful (37337) ..	" "
Rydon May Queen 2nd (55151) ..	589	18.8.33	3	2	648	9,706	507	Melrose Migrant (6874) ..	Elanora May Queen 2nd (38289)	E. J. Vagg
Springhurst Tomato 3rd (38110) ..	587	24.6.30	3	4	564	8,195	495	Starbright's Prince of Glen Iris (3345)	Tomato of Springhurst (18939)	J. D. Read Estate
Rintoul View Rosemary (38214) ..	582	3.10.30	3	3	579	7,911	474	Banyule Triplane (5753) ..	Relbia Pinkie (25166) ..	N. H. Enders
Aveley Marie Antoinette 2nd (25648)	581	12.10.27	1	3	607	10,173	568	Marc Anthony of Aveley (4142)	Marie Antoinette of Aveley (18496)	W. J. Wade
Springhurst Sybil Lily (41998) ..	581	9.9.31	3	4	551	8,379	471	Bellefaire Seaborn Successor (6824)	Springhurst Lily (26166)..	J. D. Read Estate
Mornmoot Fancy Madeira (37059)	578	28.1.31	4	..	607	8,641	475	Werribee Prince Madeira (6054)	Brucevale Fancy Madeira 2nd (25801)	W. G. Tait
Somerville Ramona (28781) ..	577	19.10.28	2	3	624	7,985	529	Banyule Aeronaut (5754)..	Princess Wynn of Somerville (14159)	O. Ronalds
Clifford Farm Lady Sarah (34264) ..	572	31.1.30	3	2	529	7,714	481	Clifford Farm Eliminator (6120)	Rita 4th of Linden (8439)..	R. H. Mitchell
Strathbow Goldie 5th (26155) ..	571	26.3.28	3	3	617	7,742	517	Studleigh Noble (5146) ..	Goldie of Strathbow (9645)	F. Raggatt
Taranah Flora 2nd (59633) ..	569	7.11.34	4	..	521	7,580	408	Taranah Commander (8913)	Taranah Flora (42117) ..	C. W. Macauley
Kooreena Carrie 4th (49033) ..	569	18.9.32	3	1	549	7,787	503	Kooreena Carrie 3rd's Halo (9676)	Kooreena Carrie 2nd (34100)	W. H. Hurrey Estate
Myrtle Point Songstress (45341) ..	561	10.12.31	3	2	603	10,367	521	Werribee Master King (9084)	Songstress 10th of Brookfield (21571)	R. G. Gay and Son
Belgonia Marie 4th (24491) ..	561	6.8.26	4	5	598	9,632	505	Aerial of Banyule (4533) ..	Marie 2nd of Belgonia (12995)	P. J. Maloney
Belgonia Design's Eileen (51698) ..	560	18.8.34	3	1	534	7,724	481	Design's Ruler (Imp.) (7804)	Belgonia Eileen (38827) ..	" "
The Wattles Princess 4th (50857) ..	559	17.11.33	4	1	504	8,097	461	The Wattles Biplane (8758)	The Wattles Princess 2nd (33990)	N. H. Enders
Monterey Melody's Mascot (58530)	552	20.6.34	3	1	583	9,419	487	Rosecliff Mariposa's Master (9127)	Mornmoot Melody 2nd (33134)	T. S. Powell
Koomangoonong Lady Diana (16344)	551	7.10.22	..	4	596	10,190	551	Nipheto's Twylish of Willis Vale (1945)	Dunallister Lady Lydia (10376)	W. J. Clark

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
***Jerseys*—continued.**										
Mer Vue Choice 4th (58404) ..	550	30.8.33	3	1	502	7,769	481	Woorayl Flashlight (5375)	Wood Choice (28590) ..	F. W. Clarke
Selsey Brown May (50566) ..	548	9.3.32	2	2	597	8,032	512	Retford Glider (6353) ..	Retford Magenta (11467)..	M. A. Nicholas
Clarendon Eyre Eileen 2nd (13521)	547	7.11.21	1	6	564	9,026	504	Lotina Larkspur's Twylish (235)	Chevy 16th of Melrose (10361)	P. J. Maloney
Mornmoot Northwood Madeira 2nd (37070)	546	26.8.31	3	3	555	9,210	476	Werribee Prince Madeira (6054)	Brucevale Northwood Madeira 2nd (24295)	R. M. Chirnside
Ballara Lassie 3rd (42861) ..	542	23.9.31	3	2	487	8,224	459	Brucevale Lord Fancy Madeira (7920)	Ballara Lassie 2nd (18999)	E. Hore
Strathbow Heather Belle (29326)	538	29.7.28	3	5	546	6,792	450	Studleigh Noble (5146) ..	Mayland's Heather Belle (26150)	J. O'Neill
Ballara Bluebell 4th (38007) ..	537	17.9.30	3	3	519	8,232	455	Brucevale Lord Fancy Madeira (7920)	Ballara Bluebell (26250)	„ „
Lassie 2nd of Ballara (18999) ..	537	15.9.24	4	2	561	8,746	461	Silver Boy of Wooringa (2472)	Romany Girl 2nd of Tarnpirr (7062)	F. Trevaskis
Springhurst Sybil Tulip (55281) ..	534	29.9.34	4	..	513	7,531	440	Springhurst Golden Gamboge (11114)	Tulip 4th of Springhurst (21611)	J. D. Read Estate
Mornmoot Modesty 2nd (33138) ..	533	27.7.29	3	4	543	7,353	416	Choirmaster of Banyule (2712)	Queen Jessie of the Falls (17812)	K. E. Watson
Bellaire Molly 8th (37975) ..	533	21.3.30	3	4	552	8,434	482	Werribee Fancy Clementine King (3109)	Molly 5th of Bellaire (28586)	Nancarrow Bros.
Mer Vue Choice 3rd (54081) ..	532	21.7.33	3	1	532	7,677	460	Woorayl Flashlight (5375)	Mer Vue Choice 2nd (45131)	F. W. Clarke
Victoria Flirt (33272)	532	21.3.30	3	4	614	7,525	480	Victoria Jack Tar (6663)	Victoria Charm (28657) ..	Dept. of Agric., Burnley
Monterey Maid's Mermaid (58528)	531	24.6.34	3	1	608	9,070	466	Rosecliff Mariposa's (9127)	Mornmoot Maid (33125) ..	T. S. Powell
Inverbroom Silvermine's Marie (44392)	531	16.9.32	3	2	589	8,816	489	Economist of Aveley (4522)	Aveley Marie Antoinette 2nd (25648)	W. J. Wade
Wattle Vale Golden Girl (24307)	530	3.10.26	4	2	481	7,621	428	Duke of Melrose (2971) ..	Grey Girl of Wattle Vale (9267)	A. P. Prout
Barrowby Rose Fancy (56280) ..	529	2.3.34	4	1	541	7,709	424	Wompini Twylight (10227)	Marimba Briar Rose 3rd (29567)	S. C. Handley
Springhurst Sybil Soya (50634) ..	529	17.4.34	3	1	601	9,110	463	Bellefaire Seaborn Successor (6824)	Springhurst Soya (38107)	J. D. Read Estate
Jerseyinn Nasturtium 3rd (37995)	529	7.10.29	4	..	494	7,351	429	Werribee Bluebell's Masterpiece (5569)	Nasturtium of Glen Iris (18790)	T. M. Noble and Son
The Wattles Silvermine 2nd (55525)	524	24.7.34	3	1	514	7,878	461	Woodside Chrissy's Gamboge (11251)	The Wattles Silvermine (46425)	N. H. Enders
Normandy Buttercup 2nd (33188)	524	13.7.29	4	5	486	7,031	402	Peer of Lewisham (4483)	Buttercup of Hazelbrook (18665)	L. W. Colenso
Rosemont Daisy 4th (26063) ..	520	23.8.26	4	4	488	6,223	386	Rosella 2nd's Noble of Rosemont (2720)	Daisy 2nd of Rosemont (15550)	R. H. Maher
Turro Park Eminent Duchess (33240)	520	24.7.30	4	2	474	7,875	426	Aveley Drummer (7719)	Turro Park Graceful Duchess (21313)	Mrs. E. Crawford
Springhurst Blonde Aconite (50622)	520	27.6.34	3	1	528	7,841	438	Bellefaire Seaborn Successor (6824)	Aconite of Springhurst (21598)	J. D. Read Estate
Linga Longa Wattle Speck (25574)	519	1.11.26	4	8	558	8,431	457	Canary's Handsome Boy of Linga Longa (5072)	Speck of Linga Longa (21113)	T. M. Noble and Son
Boorene Silver Light (25542) ..	519	7.3.28	3	6	519	7,272	444	Lady Grey's Silvermine 2nd of Somerset (3497)	Silvermine's Clara of Boorene (25250)	G. A. McNabb and Son
Taranah Floss (37857)	514	30.8.29	4	3	530	7,524	435	Duke of Invermay (3693)	Taranah Fairy (16716) ..	C. W. Macauley
Taranah Rainbow (42118) ..	514	3.12.30	4	3	487	7,135	404	Duke of Invermay (3693)	Taranah Roseleaf 2nd (29086)	„ „

Elm Grove Buttercup (21303) ..	514	2.8.25	2	3	553	8,884	470	Gold Star of Melrose (4248)	Dairymaid 5th of Waterloo Farm (17743)	R. G. Gay and Son
Selsey Rose (41947)	513	4.6.31	3	3	504	7,630	426	Jubilee Asterlight (7860)	Jubilee Ranunculus (26186)	M. A. Nicholas
Tooravale Starleigh 7th (50898) ..	513	23.9.30	4	2	583	6,760	413	Tooravale Gold Speck (5446)	Tooravale Starleigh 3rd (25909)	J. E. Handbury and Son
Troed-yr-Rhiw Carlad 2nd (50927)	513	1.7.32	3	2	522	7,985	446	Montrose Duke of Glen Iris (6090)	Troed-yr-Rhiw Carlad (23266)	E. Hore
Tooravale Lassie 17th (55580) ..	510	21.9.33	4	..	482	7,292	420	Kingsvale Monica 14th's Son (6625)	Tooravale Lassie 2nd (25904)	J. E. Handbury and Son
Monterey Maid (49602)	510	30.9.32	2	2	520	9,664	477	Mornmoot Starbright King (6572)	Mornmoot Maid (33125) ..	T. S. Powell
Belgonia Design's Noella (42697)	508	16.7.31	3	3	479	7,893	431	Design's Ruler (Imp.) (7804)	Gem's Noella (Imp.) (33497)	G. and M. Daley
Elm Grove Lady Fowler (34021)	505	22.3.29	3	1	495	7,526	444	Gold Star of Melrose (4248)	Lassie Fowler 12th (16697)	R. G. Gay and Son
Tavistock Valerie (55444) ..	504	28.10.33	4	1	502	7,041	407	Werribee Ranger (5411) ..	Tavistock Honesty 3rd (37148)	E. Hore
Belgonia Peggy 9th (37898) ..	504	27.7.30	3	4	540	8,746	434	Aveley Rex (6612) ..	Belgonia Peggy 6th (29117)	Nancarrow Bros.
Springhurst Tecoma 4th (33651) ..	503	29.10.29	4	..	451	6,845	413	Starbright's Prince of Glen Iris (3345)	Tecoma of Springhurst (12225)	G. and M. Daley
Selsey Design (50567)	502	4.11.32	3	2	485	9,447	451	Design's Ruler (Imp.) (7804)	Jubilee Cineraria (33794)	J. G. Norman
Sleepy Valley Milkmaid (59447) ..	501	11.4.32	4	3	470	6,585	394	Holly Dell Twylish (7746)	Melview Milkmaid (29394)	A. and W. Shearman
Windrest Rose Marie (55878) ..	500	2.11.33	4	1	515	7,104	399	Clarendon Eyre Eminent's Achievement (4154)	Aberdour Rance (23519)	Dr. A. R. Haywood
Studleigh Duchess 3rd (25289) ..	500	17.2.27	4	2	449	6,514	387	Brucevale Lord 5th (3319)	Studleigh Duchess (18653)	W. H. Lyon
Kyora Dream Girl (29160) ..	497	8.9.27	3	4	517	8,164	464	Perree's Duke (Imp.) (996)	Dream Girl of Woodside (6395)	Nancarrow Bros.
Taranah Chime (55424)	497	29.12.31	4	2	483	7,118	396	Duke of Invermay (3693)	Taranah Carol (29083) ..	C. W. Macauley
Bamawm Fancy Gem (47100) ..	496	29.8.33	3	2	490	7,184	433	Bamawm Leon (9108) ..	Ballara Garenne's Fancy 6th (38780)	F. A. Williams
Bamawm Mayflower (47101) ..	495	9.9.33	3	1	450	7,611	423	Bamawm Leon (9108) ..	Mornmoot Mascot (28555)	"
Banaview Lilac Domino 2nd (51635)	495	7.10.33	4	1	496	6,650	405	Banaview Nova (9194) ..	Claren Eyre Lilac Domino (39253)	J. G. Norman
Brucevale Northwood Madeira 2nd (24295)	495	22.5.26	2	3	597	8,025	458	Masterpiece of Brucevale (3824)	Madeira 6th (6540) ..	R. M. Chirnside
Springhurst Coronation Nightshade (46183)	495	17.3.32	3	2	476	7,762	436	Design's Ruler (Imp.) (7804)	Springhurst Nightshade 3rd (26170)	J. D. Read Estate
Finchley Handsome Lady 2nd (43886)	494	9.3.32	3	3	504	6,430	435	Finchley Lord Harmony (8078)	Finchley Handsome Lady (37993)	T. M. Noble and Son
Banyule Silvermine 74th (34195) ..	491	20.11.30	3	1	472	7,281	372	Superstrain of Banyule (4529)	Banyule Silvermine 53rd (25471)	C. G. Lyon
Weir View Golden Duchess 2nd (51162)	491	14.9.34	4	..	486	7,593	403	Weir View Laddie 2nd (12328)	Weir Golden Duchess (51161)	C. S. Walker
Leven Brae Gay Countess (40698)	491	16.1.28	4	5	531	8,031	396	Werribee Gaypiece (4823)	Twylish Countess of Leven Brae (16641)	E. Hore
Springhurst Coronation Narcissus (50625)	490	21.4.34	3	1	519	7,622	423	Springhurst Design's Analyst (11112)	Springhurst Sybil Narcissus (46191)	J. D. Read Estate
Mer Vue Choice 2nd (45131) ..	490	5.8.31	2	4	520	6,824	431	Tooravale Silver King (7699)	Wood Choice (28590) ..	F. W. Clarke
Taranah Roseleaf 4th (37589) ..	489	12.10.30	1	4	525	8,747	465	Taranah Submarine (7798)	Taranah Roseleaf (23293)	E. Hore
Tooravale Lassie Fowler 14th (50893)	488	25.11.32	3	2	497	7,014	428	Kingsvale Monica 14th's Son (6625)	Melrose Lassie Fowler 7th (4542)	J. E. Handbury and Son
Mornmoot Modeste 2nd (33140) ..	488	15.4.30	3	4	452	6,064	379	Werribee Prince Madeira (6054)	The Falls Air Beauty (24816)	K. E. Watson
Ballara Model 6th (33837) ..	488	31.8.29	3	2	507	7,077	439	Brucevale Lord Fancy Madeira (7920)	Model of Ballara (19000)	J. O'Neill
Coimbra Silvermine (56854) ..	487	6.2.35	3	1	492	8,628	411	Banyule Triplane (5753)	Banyule Silvermine 67th (28848)	H. V. Stirling
Lassie Fowler of Rosemont (13224)	487	13.8.21	3	4	545	7,461	417	Cobber of Banyule (1923)	Lassie Fowler 8th of Melrose (9892)	R. H. Maher
Maxon Noble Alsyke (34221) ..	487	14.3.30	4	3	508	7,724	418	Avalon Noble 8th (5380)	Alsyke 3rd of Spronghurst (16960)	G. A. McNabb and Son
Bamawm Pretty Lady (56239) ..	486	2.10.34	4	..	634	6,857	411	Bamawm Master Gaypiece (11338)	Bamawm Bonnie Lass (47099)	F. A. Williams
Kantara Ditny's Larkspur (29378)	485	2.10.28	3	2	479	6,728	402	Ku Ku Fashion Plate (Imp.) (3685)	Ditny of Clarendon Eyre (11651)	C. G. Smith
Rosyth Lady Tulip 3rd (38451) ..	484	29.9.29	4	4	504	7,202	414	Lord 2nd of Brucevale (3563)	Rosyth Tulip (21083) ..	E. J. Vagg

Advanced Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
***Jerseys*—continued.**										
Brucevale Fancy Starbright 3rd (28544)	482	15.7.28	3	4	562	7,168	444	Masterpiece of Brucevale (3824)	Fancy Starbright of Brucevale (24180)	M. A. Nicholas
Werribee Clementine Princess 3rd (24583)	481	15.8.26	3	3	538	7,244	423	Masterpiece (Imp.) (2394)	Werribee Island Clementine 2nd (15465)	„ „
Troed-yr-Rhiw Eastern Queen (59794)	481	3.8.34	3	1	428	7,257	402	Clarendon Eyre Oxford Dreamer (10273)	Troed-yr-Rhiw Mifanny 2nd (37766)	E. Hore
Oak Park Sweet Lady (45498) ..	480	18.12.31	4	1	507	5,915	388	Brucevale Lord Fancy Attraction (9041)	Owangella Verbena 3rd (38307)	A. and W. Shearman
Glen Leigh Duchess 4th (25791) ..	480	1.10.27	2	4	511	7,686	440	Gadabout of Danton (4480)	Duchess 10th of Kyora (6835)	J. E. Chadderton
Grangelea Bell (40060)	479	24.9.31	4	2	505	6,942	403	Grangelea Daffodil's Airo (7675)	Grangelea Daisy Bell (33034)	Mrs. A. A. Broad
Kooreena Yo Yo (44759) ..	478	19.9.32	4	1	438	7,379	398	Columbine's Defiance of Linga Longa (4419)	Lulu 5th of Roelands (17438)	W. H. Hurrey Estate
Springhurst Sybil Medick (41999)	477	3.7.31	3	4	577	7,142	452	Bellefaire Seaborn Successor (6824)	Springhurst Purple Medick (29337)	J. D. Read Estate
Weir View Golden Duchess (51161)	476	2.2.33	3	2	477	8,577	428	Duke of the Lake (Imp.) (7805)	Weir View Wattle Blossom (38428)	J. V. Trewin
Banaview Lilac Domino 4th (56240)	474	12.11.34	4	..	435	6,793	389	Banaview Silvermine Sultan (10345)	Banaview Lilac Domino 4th (47105)	J. G. Norman
Sylvan Hill Primrose (38284) ..	474	6.8.29	3	4	460	7,150	394	Heir Apparent of Somerville (5460)	Sylvan Hill Daisy (21669)	Smith Bros.
Rutland Brunette 10th (59354) ..	473	16.7.34	3	1	494	7,976	417	Kingsvale Lauder (10792)	Rutland Brunette (29130)	S. H. Masters and Son
Rutland Bright Stockings (41918)	473	11.7.30	4	3	472	7,796	396	St. Albans Fuchsia's Superior (6115)	Lea Hurst Silk Stockings 5th (26073)	„ „ „
Glen Valley Waverley Lass 2nd (24405)	472	30.7.26	3	4	456	6,765	407	Rosebud's Top Note of Glen Valley (4507)	Waverley Lass 3rd of Melrose (6312)	J. A. Huffer
Banyule Silvermine 46th (24466)	471	19.4.27	3	2	462	7,697	410	Wooton Airman (Imp.) (2716)	Silvermine 29th of Banyule (14195)	H. V. Stirling
Cleveland Countess Lily Petal (21579)	471	7.3.25	2	4	555	8,132	418	Maitland Petal Viscount of Elouera (3418)	Jacqueline's Lily of Hillgreen (12235)	Mrs. K. E. Powell
Milvue Twylish Bettwys (58470)	471	20.6.34	3	1	473	7,973	414	Milvue Christmas Melody (10900)	Troed-yr-Rhiw Bettwys 2nd (42295)	E. Hore
Tooravale Lassie 12th (50819) ..	469	27.8.32	4	..	469	6,923	386	Kingsvale Monica 14th's Son (6625)	Tooravale Lassie 5th (28731)	J. E. Handbury and Son
Pine Ridge Silvermine 2nd (58999)	468	10.11.34	4	..	463	7,503	386	Duke of the Lake (Imp.) (7805)	Silvermine 27th of Banyule (11603)	Nancarrow Bros.
Glen Leigh Dora 2nd (28532) ..	467	7.2.29	3	3	500	7,638	446	Gadabout of Danton (4483)	Glen Leigh Duchess 2nd (15463)	J. E. Chadderton
Mount Violet Kyeema (23374) ..	467	3.7.26	2	3	581	8,375	428	Statesman of Colac (5144)	Monomeeth Kyeema (18987)	Mrs. K. E. Powell
Glen Leigh Dawn 2nd (48264) ..	466	29.9.33	3	1	491	6,827	409	Glen Leigh Bounty (8675)	Glen Leigh Duchess 4th (25791)	J. E. Chadderton
Elm Grove Silverbell (23159) ..	466	28.8.26	3	5	478	6,576	401	Gold Star of Melrose (4248)	Silvermine of Brookside (9724)	R. G. Gay and Son
Grangelea Roseleaf 3rd (33041) ..	465	10.9.29	3	3	481	7,439	424	Banyule Airo (5751) ..	Grangelea Rosebud 3rd (18657)	Mrs. A. A. Broad
Maxon Countess Light (49425) ..	465	2.7.33	4	1	735	7,319	451	Maxon Count Graceful (a754)	Boorene Silver Light (25542)	G. A. McNabb and Son
Wattle Vale Wild Flower (23389)	464	1.11.25	2	2	464	8,447	433	Duke of Melrose (2971) ..	Wattle Vale Daphne (16236)	A. P. Prout
Belgonia Design's Marie 2nd (51700)	463	16.7.34	3	1	463	8,201	403	Design's Ruler (Imp.) (7804)	Belgonia Marie 4th (24491)	P. J. Maloney

Kantara Jassamine 2nd (40487)	463	15.1.31	4	4	451	7,792	404	Glen Iris Valient Count (6135)	Kantara Jassamine (29389)	J. H. Phillips
Mornmoot Modesty 3rd (33139) ..	462	17.7.30	4	..	450	7,190	385	Werribee Prince Madeira (6054)	The Falls Queen Jessie (17812)	S. J. McCosh
Sylvan Hill Duchess (50736) ..	462	28.7.31	2	4	510	7,697	433	Somerville Heir Apparent (5460)	Duchess 4th of Goulburn (11711)	Smith Bros.
Bamawm Princess Pamela (47103)	461	25.9.32	3	3	537	7,033	399	Bamawm Leon (9108) ..	Avalon Gladstar Pansy (28399)	F. A. Williams
Inverbroom Silver Muriel 2nd (38483)	459	17.9.30	3	4	433	8,496	391	Economist of Aveley (4522)	Avonview Muriel (23140)	W. J. Wade
Kooreena Audrey 8th (49032) ..	458	17.12.33	4	..	435	5,217	377	Kooreena Carrie 3rd's Delegate (6081)	Kooreena Audrey 3rd (34099)	W. H. Hurrey Estate
Wompini Starbright (60091) ..	457	25.4.34	3	1	428	6,542	399	Werribee Butter King (4802)	Kantara Starbright (40492)	T. S. Powell
Warwick Augustus Marie (38486)	456	26.9.29	4	3	433	7,757	372	Chevrolet of Banyule (4443)	Boorene Augustus Marie (26295)	C. S. Walker
Sylvan Hill Opal (59606) ..	456	29.7.34	3	1	489	6,054	384	Jerseyholm Handsome Boy 3rd (6766)	Sylvan Hill Jewel, (29487)	Smith Bros.
Maxon Noble's Goldfinch (45069)	456	20.7.32	3	2	478	7,331	406	Avalon Noble 8th (5380)	Grangelea Goldfinch 3rd (23004)	G. A. McNabb and Son
Maxon Sweet Estelle (54029) ..	454	8.10.34	4	..	488	6,128	374	Maxon Count Graceful (6754)	Sweet Estelle's Pansy of Boorene (11231)	G. A. McNabb and Son
Antimony's Trixie of Belle Vue (15569)	454	12.12.21	..	8	479	8,210	404	Columbine's Antimony (2070)	Trixie of Belle Vue (15280)	J. Moore and Co.
Springhurst Hussey Alsyke (50630)	453	11.6.34	3	1	447	6,201	382	Bellefaire Seaborn Successor (6824)	Springhurst Alsyke 2nd (10437)	J. D. Read, Estate
Rutland Brunette 6th (50524) ..	453	18.8.32	4	2	407	6,975	376	Rutland's Rover (10015)	Rutland Brunette 3rd (41919)	S. H. Masters and Son
Kooreena Audrey 7th (49031) ..	453	29.9.33	3	1	435	6,072	396	Kooreena Carrie 3rd's Delegate (6081)	Kooreena Audrey 4th (40578)	W. H. Hurrey Estate
Glenvalley Silvershine (52946) ..	452	12.9.31	4	3	420	6,578	380	Melrose Ensign (6711) ..	Glenvalley Silversand (18756)	J. H. Huffer
Lynroy Fancy 4th (62864) ..	452	26.8.34	4	..	465	6,645	372	Werribee Laverock (9085)	Lynroy Fancy (38459) ..	Vaughan Bros.
Glen Leigh Daphne (48263) ..	451	6.9.34	4	..	456	6,672	371	Glen Leigh Bounty (8675)	Glen Leigh Doris 3rd (37039)	J. E. Chadderton
Tooravale May 7th (59765) ..	451	25.8.34	4	..	406	7,533	369	Tooravale Monica's Son (10121)	Tooravale May 5th (50894)	J. E. Handbury and Son
Belgonia Blossom 7th (29112) ..	451	2.9.27	..	4	484	9,160	451	Ariel of Banyule (4533) ..	Blossom of Belgonia (21490)	J. V. Trewin
Sylvan Hill Joyful (50738) ..	450	18.7.32	3	3	471	7,463	407	Somerville Heir Apparent (5460)	Sylvan Hill Attractive (33760)	Smith Bros.
Illillouette Bing Boy's Tangerine (48745)	449	15.11.32	3	1	432	8,269	393	Clarendon Eyre Eminent's Bing Boy (5781)	Clarendon Eyre Tangerine 4th (39261)	A. J. Calf
Darnum Park Eminence's Haha (61261)	448	25.3.34	3	1	429	7,302	392	Darnum Park Starbright's Masterpiece (9383)	Clarendon Eyre Minniehaha 4th (15040)	A. and W. Shearman
Maxon Bright Favourite (45055) ..	447	4.8.32	3	3	605	7,565	404	Maxon Starbright Prince 5th (8912)	Maxon Count's Favourite (37851)	G. A. McNabb and Son
Banaview Jonquil (47104) ..	447	18.8.32	3	2	454	8,429	400	Kantara Starbright's Sultan (7867)	Kantara Jonquil (40488)	J. G. Norman
Sutton Lea Airflier (38134) ..	447	15.12.29	3	4	494	6,387	404	Banyule Petalon 2nd (6185)	Golden Pariel 2nd of Boorene (11227)	W. S. Richardson
Grangelea Rosella 3rd (48528) ..	446	4.8.33	3	1	453	6,857	392	Banyule Macon (6174) ..	Grangelea Rosella 2nd (40067)	Mrs. A. A. Broad
Springvale Countess 2nd (46162) ..	446	24.3.32	3	3	468	7,378	383	St. Alban's Thelma King 2nd (5713)	Springvale Countess (25783)	A. J. Calf
Maxon Graceful Bouvardia (49426)	445	28.2.34	4	1	456	5,504	362	Maxon Count Graceful (6754)	Maxon Bright Bouvardia (37848)	G. A. McNabb and Son
Maxon Count's Lodestone (40932)	445	13.6.31	3	3	468	5,871	386	Maxon Count Graceful (6754)	Lodestone of Springhurst (21608)	G. A. McNabb and Son
Ballara Beauty 2nd (29557) ..	445	3.8.28	3	4	493	6,432	395	Werribee Madeira Cream's Masterpiece (3552)	Garenne 2nd of Brucevale (17719)	H. Jackson
Glen Leigh Destiny 2nd (43973) ..	445	19.3.33	3	2	422	6,578	392	Glen Leigh Bounty (8675)	Glen Leigh Dora (25789)	J. E. Chadderton
Sylvan Hill Beauty (38277) ..	445	10.8.29	2	6	435	6,180	377	Somerville Heir Apparent (5460)	Sylvan Hill Lily (21670)	Smith Bros.
Laura of Rosemont (12992) ..	444	15.7.21	3	4	476	6,649	380	Cobber of Banyule (1923)	Laura 12th of Melrose (9894)	R. H. Maher
Elm Grove Dawn (52626) ..	444	11.5.33	3	2	545	7,329	395	Gold Star of Melrose (4248)	Elm Grove Daphne (39640)	R. G. Gay and Son
Ullina Heather Belle 2nd (59830) ..	444	11.8.34	4	..	450	6,242	372	Kyora Dream's Gadget 2nd (10815)	Ullina Heather Belle (46542)	J. O'Neill
Avalon Noble's Pansy 3rd (36833)	442	8.7.30	4	2	431	5,925	370	Noble of Avalon (3639) ..	Avalon Gladstar Pansy (28399)	G. A. McNabb and Son

Register of Merit for Standard Herd Test. (273 Day Period of Test)—*continued.*

Name of Cow with Herd Book No.	Production Attainment (Average of Four Best Consecutive Yields).	Details to Date of Life Time. (No age allowances.)						Details of Breeding.		Name of Owner.
		Date of Birth.	No. of Test Records.		Highest Individual Record.	Average Yield over all Lactations.		Name and H.B. No. of Sire.	Name and H.B. No. of Dam.	
	B.-fat (lb.).		Under 5 yrs.	Over 5 yrs.	Fat (lb.).	Milk (lb.).	B.-fat (lb.).			
Jerseys—continued.										
Belgonia Peggy 10th (38831) ..	441	8.9.31	3	2	520	8,557	474	Aveley Rex (6612) ..	Belgonia Peggy 6th (29117)	P. J. Maloney
Tiny 3rd of Beverley (21097) ..	439	9.8.25	4	6	501	7,327	392	Rosella's Lad of Kingsvale (3106)	Tiny of Beverley (13323)	Dr. A. R. Haywood
Rutland Brunette 13th (59357) ..	439	11.8.34	3	1	425	7,186	385	Kingsvale Lauder (10792)	Rutland Brunette 6th (50524)	S. H. Masters and Son
Mornmoot Stellar Princess (45272)	439	27.10.32	3	2	428	7,331	396	Werribee Prince Madeira (6054)	Werribee Stellar Princess (37073)	T. S. Powell
Glen Leigh Doris 3rd (37039) ..	438	23.1.31	3	3	493	7,422	399	Strathkellar Top Thorn (6049)	Glen Leigh Duchess (15462)	J. E. Chadderton
Orphanage V. C. Molly (36860) ..	438	19.7.29	3	3	429	7,848	378	Wimpini V.C. (4550) ..	Tavistock Molly (16240)	Ballarat Orphanage
Rutland Brunette 12th (59356) ..	437	2.8.34	3	1	456	7,528	385	Kingsvale Lauder (10792)	Rutland Brunette 4th (50522)	S. H. Masters and Son
Vaucluse Daphne (51012) ..	437	20.9.32	3	1	519	6,010	387	Vaucluse Duké 3rd (10150)	Vaucluse Pansy (42368)	Fairchild and Clutterbuck
Kooreena Audrey 6th (49030) ..	435	4.9.33	3	1	413	6,229	380	Kooreena Carrie 3rd's Halo (9676)	Kooreena Audrey 2nd (28773)	W. H. Hurrey Estate
Mornmoot Modesty 5th (41128) ..	434	18.9.32	3	2	380	6,550	348	Werribee Prince Madeira (6054)	Mornmoot Modesty 2nd (33138)	S. J. McCosh
Sylvan Hill Lady Alma (38282) ..	433	31.7.29	2	6	500	7,282	401	Somerville Heir Apparent (5460)	Sylvan Hill Alma (23444)	Smith Bros.
Sylvan Hill Bonnie Mary (55377)	433	14.7.33	3	2	444	6,843	393	Jerseyholm Handsome Boy 3rd (6766)	Sylvan Hill Molly (42093)	" "
Darnum Park Princess (61266) ..	433	26.10.34	4	..	388	6,081	355	Darnum Park Starbright's Masterpiece (9383)	Oak Park Princess 2nd (41321)	A. and W. Shearman
Jerseyholm Empress 22nd (37506)	431	23.7.30	2	4	419	7,321	367	Brucevale Lord Island Fancy (4500)	Jerseyholm Empress 4th (13356)	T. Harvey
Wattle Vale Sunny (26311) ..	431	14.9.27	4	2	405	6,678	351	Retford Deer's Noble (2544)	Wattle Vale Daphne (16236)	A. P. Prout
Sylvan Hill Handsome Girl (33702)	430	27.7.28	2	6	450	6,520	407	Jerseyholm Handsome Boy 3rd (6766)	Sylvan Hill Starlight (23447)	Smith Bros.
Weir View Greetings (42459) ..	429	26.7.32	2	3	454	7,771	399	Belgonia Milk Lad (7921)	Weir View Blossom's Nathalie (33839)	J. V. Trewin
The Wattles Hazel 2nd (55512) ..	428	22.9.34	3	1	421	7,141	369	Woodside Chrissy's Gamboge (11251)	Jubilee Witch Hazel (18940)	N. H. Enders
Bonnay Amanda's Doris (51865) ..	427	19.9.33	3	2	402	7,309	359	Jerseyinn Edith's Masterpiece (9082)	Bonnay Lady's Amanda (38975)	E. J. Vagg
Olivedale Buttercup (37381) ..	427	3.6.29	3	3	395	6,290	368	Studleigh Dandy (5435) ..	Olivedale Creamy (18467)	W. H. Lyon
Sylvan Hill Countess (38278) ..	425	20.7.29	2	5	443	7,342	385	Somerville Heir Apparent (5460)	Duchess 4th of Goulburn (11711)	Smith Bros.
Maxon Bright Clara (54013) ..	425	11.9.34	4	..	451	6,222	357	Maxon Starbright's Prince 5th (8912)	Maxon Noble's Clara (34222)	G. A. McNabb and Son
Sylvan Hill Charm (46300) ..	424	22.7.31	3	4	432	7,426	374	Somerville Heir Apparent (5460)	Sylvan Hill Attractive (33760)	Smith Bros.
Grangelea Rosella (33042) ..	424	29.8.29	3	1	418	6,610	372	Banyule Airo (5751) ..	Grangelea Rosebud 4th (26393)	Mrs. A. A. Broad
Belgonia Gem's Noella (42922) ..	422	16.8.32	3	1	552	9,478	475	Duke of the Lake (Imp.) (7805)	Gem's Noella (Imp.) (33497)	P. J. Maloney
Elm Grove Laura (37416) ..	422	17.1.31	4	2	387	6,010	355	Gold Star of Melrose (4248)	Laura 10th of Melrose (9893)	R. G. Gay and Son

Jubilee Rowan (38128)	420	18.1.30	3	3	405	7,084	357	Jubilee Whatlight (4861)	Jubilee Rhododendron (19946)	M. A. Nicholas
Victoria Flame (51025)	420	5.5.34	3	1	477	5,740	370	Melrose Lord Essex (9761)	Victoria Flirt (33272) ..	Dept. of Agriculture, Burnley
Sylvan Hill Peeress (40302) ..	417	13.8.31	3	3	421	6,496	349	Sylvan Hill Starlight's Pride (6372)	Sylvan Hill Countess (38278)	Smith Bros.
Bonnay Phyllis 38978	417	25.7.30	3	4	449	6,881	370	Welbourne Handsome Boy (5573)	Queensvale Phyllis (19964)	E. J. Vagg
Vaucluse Princess (55699) ..	416	18.9.34	4	..	429	6,038	343	Paisley Master (12009) ..	Vaucluse Empress 3rd (51013)	Fairchild and Clutterbuck
Wattle Vale Daphne (16236) ..	416	8.8.22	2	7	453	7,745	347	Auburn of Kelburn (2026)	Millie of Kelburn (9270)..	A. P. Prout
Normandy Mayflower 6th (45473)	415	28.4.32	3	2	444	7,089	362	Normandy Majestic (7705)	Normandy Mayflower 4th (33194)	L. W. Colenso
Normandy Ilma (25329) ..	415	15.6.27	2	4	479	8,088	411	Thelma's King of St. Albans (4115)	Ilma of Hazelbrook (18665)	„ „
Maxon Count's Lodestone 2nd (54020)	413	25.8.34	3	1	522	6,271	364	Maxon Count Graceful (6754)	Lodestone of Springhurst (21608)	G. A. McNabb and Son
Normandy Golden Nancy (49868)	412	7.3.33	3	2	396	6,243	366	Normandy Golden Peer (9860)	Nancy 4th of Somerset (17401)	L. W. Colenso
Noorat Air Lady (36909) ..	412	13.10.30	3	2	402	6,595	368	Air Lord of Banyule (3337)	Noorat Gazelle (25268) ..	Miss G. Black
Maxon Mercedes Ranunculus (45067)	412	27.9.32	4	2	394	5,777	345	Maxon Mercedes Chief 4th (8063)	Ranunculus 2nd of Springhurst (18937)	G. A. McNabb and Son
Jubilee Myrtle (33665)	409	25.5.28	2	5	421	6,896	360	Jubilee Whatlight (4861)	Jubilee Marigold (23391)	M. A. Nicholas
Grangelea Rosebud 3rd (18651) ..	408	17.8.24	1	5	426	8,128	390	Golden Twylish (1017) ..	Grangelea Rosebud 2nd (14132)	Mrs. A. A. Broad
Elmwood Merry Lark (57189) ..	408	9.2.33	2	2	416	6,748	380	Austral Valley Lord Larkspur (8832)	Elmwood Merry Girl (37572)	J. L. Coulthard and Son
Sylvan Hill Alma Belle (42089) ..	407	10.8.30	3	4	400	6,150	341	Somerville Heir Apparent (5460)	Sylvan Hill Alma (23444)	Smith Bros.
Jubilee Ricious (38344)	407	12.9.30	4	3	388	6,198	330	Jubilee Wheatenlight (6133)	Jubilee Roseleaf (33668)..	M. A. Nicholas
Maxon Count's Pansy (40933) ..	407	20.6.31	4	1	384	5,770	339	Maxon Count Graceful (6754)	Maxon Noble's Pansy (29078)	G. A. McNabb and Son
Elm Grove Dawn (52626) ..	407	11.5.33	3	1	403	6,736	357	Gold Star of Melrose (4248)	Elm Grove Daphne (39640)	R. G. Gay and Son
Normandy Hawthorn 4th (45471)	406	17.9.32	3	2	383	5,981	323	Peer of Lewisham (4483)	Hawthorn 2nd of Belmont (18667)	L. W. Colenso
Fourshells Yvette (38349) ..	406	29.6.30	2	4	490	7,497	407	Belgonia Propeller (5776)	Boveagh Yvette (29512)	J. O'Neill
Kooreena Lady 6th (49035) ..	406	14.9.33	3	1	389	6,021	355	Kooreena Carrie 3rd's Halo (9676)	Kooreena Lady 2nd (40580)	W. H. Hurrey Estate
Illillouette Aristocrat's Tangerine (53252)	405	22.11.33	3	1	405	6,205	355	Illillouette Carrilla's Aristocrat (9612)	Clarendon Eyre Tangerine 4th (39261)	A. J. Calf
Pine Park Lady's Choice 2nd (41580)	404	1.12.30	3	4	383	5,196	291	Goronga Farm Jester (6087)	Pine Park Lady's Choice (25438)	A. O. Foster
Mount Violet Silver Queen (24552)	403	19.4.27	4	2	370	6,518	330	Chief of Allambie (4541)	Queenie 3rd of Springvale (13334)	Mrs. K. E. Powell
Sylvan Hill Buttercup (40299) ..	403	30.7.31	2	4	423	6,413	373	Somerville Heir Apparent (5460)	Sylvan Hill Daisy (21669)	Smith Bros.
Windrest Chevy (42529) ..	402	21.2.32	4	3	427	5,690	353	Edmonton Rarius (3936)	Chevy 13th of Melrose (11775)	Dr. A. R. Haywood
Grangelea Rose 5th (48525) ..	402	7.10.33	3	1	336	7,173	333	Banyule Macon (6174) ..	Grangelea Roseleaf 2nd (26394)	C. S. Walker
Pinceleigh Golden Lass (33635) ..	401	23.10.28	4	..	384	5,443	335	Wattle Vale Aladdin (6128)	Wattle Vale Golden Girl (24307)	A. P. Prout
Kyora Gadget's Twinkle (58081) ..	401	3.9.34	3	1	401	5,973	352	Gadget (Imp.) (7961) ..	Kyora Twinkle 2nd (15044)	A. J. Calf
Brookfield Rosalind 22nd (47445) ..	401	26.8.32	2	2	423	6,517	373	Brookfield Ewell (5141) ..	Brookfield Rosalind 5th (15589)	J. L. Coulthard and Son

RED POLLS.

Victoria Volt (4049B)	501	24.7.31	3	3	537	9,838	438	Victoria Vice Captain (1267A)	Victoria Eructation (3226C)	State Research Farm
Maryville Elva (3722A)	446	17.2.33	4	1	402	7,451	340	Victoria King Bird (940A)	Maryville Ena (3135B) ..	F. T. Butcher
Victoria Eructation (3226C) ..	405	19.3.29	4	4	395	8,057	357	Victoria Volcano (322A) ..	Victoria Cutty (490D) ..	State Research Farm

Soil Drift Control

THE State Rivers and Water Supply Commission has inaugurated a competition for the control of soil drift on a Mallee farm. As soil drift causes great losses in land fertility, and enormous waste of time, labour and money in maintaining water channels, roads, railways, fences and buildings, it is essential that the best control methods which are available should be made generally known.

Mr. H. Hanslow, Commissioner of the State Rivers and Water Supply Commission, has presented a sterling silver cup, valued at £50, for annual competition and open to farmers dealing with this problem in the best way. The cup will be housed in a handsome wooden cabinet which has been presented by the Forests Commission. In addition to holding the cup for one year each winner will receive a replica of the cup.

Mallee farmers, therefore, have been invited to enter this competition, for which there is no entrance fee, and by so doing, not only will they conserve the fertility of their own farms but also help to prevent the enonomic waste of man power and money caused in removing the drifted soil.

The "Hanslow" cup presented by Mr. Commissioner Harold Hanslow for soil drift control competition.

Conditions of the Competition.

The competition will be open to farmers in the Mallee districts who are attempting by one or more methods to control soil drift. The Judge will take into consideration the problems faced by each individual farmer, so assessing his degree of difficulty. Even the best effort to control soil drift may not result in complete success, but the competition will be judged mainly by the efforts made and the degree of success achieved in reducing soil drift on the cultivated areas farmed by the entrants and in relation to their general farm management and economy.

The competition will be divided into zones if necessary, and judged by officers of the Department of Agriculture. The following scale of points will be used:—

1. Steps taken to prevent or minimize drift on—
   - (*a*) Fallowed land, e.g., by cover crops, cultivation methods, retention of stubble, &c. .. 40 pts.
   - (*b*) On other land including stubble land .. .. 20 pts.

2. Success achieved in the protection of channels, roads, fences, buildings, &c. .. .. 20 pts

3. Suitability of general farming methods for the preservation of soil fertility and reduction of sand drift, including consideration of crop rotation, stocking methods, fodder conservation, and weed control .. .. 20 pts.

NOTE.—In awarding points, the Judge will give full consideration to the susceptibility to drift of the soils on each farm, thus providing a concession to the entrants faced with the greater problems. Twenty-five per cent. of the points in each section will be reserved for this purpose.

Entries for this competition closed on 31st August. Entrants will be notified in advance of the Judge's visits, which it is expected will take place in the spring and autumn. Publication of points awarded will be restricted to the three leading competitors and no person will be eligible to win the competition two years in succession.

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

THE FARMER AND THE WAR

By E. J. HOGAN, M.L.A., Minister of Agriculture

GREAT BRITAIN requires from the Dominions increased quantities of essential foodstuffs, and our producers are asking for a definite lead as to what they should do to assist the nation in its War effort.

As a result of communications with the British Government, and deliberations by the Australian Agricultural Council, we are now able to indicate the ways in which producers can help.

When shipping, carrying foodstuffs to the United Kingdom, is being menaced and destroyed by submarines and bombers, when the enemy is trying to destroy the docks and stores in Great Britain, and when no one can foresee what lies before us, it must be realized that any agricultural policy may have to be modified from time to time.

The War has already caused great changes, and Peace will bring others. But it is possible for the man on the land, by concerted efforts, to export products formerly supplied by countries outside the Empire, and, once established in those markets, he should be able to hold them.

The British Ministry of Food has indicated that foodstuffs essential to the prosecution of the war, and required in increased quantities, are dairy produce (butter, cheese, dried milk, condensed milk, &c.), eggs, and pig meats. These foods will be given priority in the allocation of available shipping space. Flax is also required to replace exports from Belgium and the Baltic countries. The position in regard to beef, mutton, and lamb has not yet been clarified.

Wine, canned fruits, and fresh fruits are low down on the United Kingdom's shipping priority list, and their export in normal quantities is very doubtful.

Dairy Products.

The United Kingdom's consumption of butter in 1938 totalled 511,000 tons, of which 465,000 tons was imported. Of the imports, New Zealand supplied 27 per cent., Australia 19 per cent., and other Empire countries 5 per cent., making a total of 51 per cent. from Empire sources. The remaining 49 per cent. came from Denmark, Netherlands, and Baltic countries (Latvia, Sweden, Lithuania, Finland, and Estonia), and Poland. German control of Western Europe has cut off one-half of the United Kingdom's normal imports of butter. This curtailment has been met by rationing, but the United Kingdom Government desires to make up portion of the shortage by increased imports from Empire countries. Consequently, an increased demand for Australian butter is assured.

The dairy industry in Denmark and Holland has suffered severely. The cutting off by the British blockade of the supply of imported animal foodstuffs, and the consequent slaughter of dairy cattle, will reduce production to a low level, and many years will elapse before these countries again become large exporters of dairy produce. This is Australia's opportunity to permanently increase her exports of these commodities to the United Kingdom.

On the outbreak of War, the United Kingdom Government contracted to purchase 94,000 tons of Australian butter and 16,500 tons of

cheese per annum. Actual shipments from Australia to Great Britain in 1939–40 amounted to 108,000 tons of butter and 18,000 tons of cheese.

These contracts have been renewed for 1940–41; provision has been made for increased quantities of butter and cheese, and the British Ministry of Food has notified us that it will purchase any additional quantities which might be produced, provided shipping is available.

Butter production in Australia for 1939–40 amounted to 214,000 tons. This record output was due to the exceptionally favorable season, and as climatic conditions for the current season have been less favorable, the quantity available for export for 1940–41 may be less than last year.

An immediate increase in butter production can be brought about by the adoption of better methods of feeding dairy herds. The cultivation of fodder crops where possible, and the conservation of surplus fodder from the flush season of the year should be extended to ensure more adequate feeding, and a more even production throughout the year. Future production can be raised by increasing the number of dairy cows, and by rearing dairy heifers that normally are killed for veal. The adoption of such a long range expansion policy is indicated and recommended.

The United Kingdom requires increased supplies of cheese. This commodity requires less exacting refrigerated storage conditions than butter, and as the capacity to provide refrigerated ships and space in Cool Stores in Great Britain may be reduced, it, consequently, is desirable that more milk should be converted into cheese. This will require the co-operation of producers and factories, the objective being to maintain production of cheese at peak level as long as possible.

Condensed and dried milk are products for which there is an increased demand. Because of its high food value in proportion to bulk, the United Kingdom Government is attaching special importance to dried milk and will take all Australia can supply. Our present production of 10,000 tons a year can be stimulated by active co-operation between producers and manufacturers in the neighbourhood of dried milk plants, and extending the producing period of the herd. Condensed milk is also in demand in eastern countries formerly supplied by Holland and Denmark. Since the occupation by Germany of these countries, a new market estimated at 1,000,000 cases of condensed milk per annum has been opened to Australia.

The dairy farmer should endeavour to maintain the output of his herd at the maximum level over the maximum period of time. He can do that by ensuring an adequate supply of fodder—by sowing down special fodder crops suited to his conditions, and by conserving any surplus feed that may be available during the next few weeks. He can also increase production in future years by building up his herd to the maximum number his property can carry under the most efficient farming methods.

Eggs for Export.

Another industry to which the War has brought possibilities for considerable expansion is that of egg production. Before the War, the United Kingdom imported annually from 20 to 28 million long hundreds of eggs, of which more than 50 per cent. came from Denmark and the Netherlands. In 1939 Australian exports totalled 986,000 long hundreds in the shell and 62,000 long hundreds as pulp. Our exportable surplus for the current year is estimated at 1,236,000 long hundreds, and that should be very considerably increased in future years. Eggs are high on the British Government's shipping priority list, and with other important sources of supply closed to her, Britain is looking to the Dominions to supply her needs.

Egg production should appeal to many wheat growers as providing a profitable means of disposing of portion of their grain. There is a limit to what expansion can be achieved during the current season, but wheat growers who propose to go in for poultry should start as soon as possible.

Pig Meats.

Owing to the difficulties in obtaining sufficient refrigerated storage space in the United Kingdom, meat is lower on the priority list than last year, but indications are that Great Britain will take Australia's normal production of mutton and lamb, and an increasing quantity of pig meats. Although the position in regard to pig meats has not been finally clarified, it is expected that Australia can look forward to some increase in her exports of pig meats.

Wheat.

Supplies of wheat available in Canada can be transported to the United Kingdom with greater economy of shipping space than from

Australia. The troubles of the Australian wheat grower have been increased by the recent serious drought. The wheat grower needs some new activity to add diversity to his operations. Pig raising and egg production afford two of such side-lines that should receive serious attention from wheat growers.

Australian farmers must seize the opportunity of producing many commodities which we imported in the past. Tobacco offers a splendid opportunity for expansion, and we should no longer depend on other countries for vegetable and pasture seeds that can be grown here.

These are some of the directions in which Victorian farmers can help in the War effort. The precise steps to be taken by individuals will depend on their own circumstances, but I hope that every farmer will do what he can to increase production of the products specified here, so that the people of the United Kingdom will be able to obtain adequate supplies of food. Officers of the Department of Agriculture are available to advise farmers on ways and means to increase production on their farms. If you want any further advise or help write to the Director of Agriculture, Melbourne, C.2, and he will help you in every practicable way.

Marketing Primary Products

Amendments to Act

A BILL to amend the *Marketing of Primary Products Act* 1935 was passed by the Legislative Assembly last month. The purpose of the amending Bill was to enable marketing Boards appointed under that Act to function more efficiently.

Explaining the Bill in the Legislative Assembly, the Minister of Agriculture (Hon. E. J. Hogan) said that the principal amendments were in clauses 3 and 4.

Clause 3 provided that a marketing Board might deduct from the net proceeds of the sale of the commodity an amount not exceeding one halfpenny in the £1 of such proceeds, or such larger amount as the Governor in Council approved, for the purpose of establishing a reserve fund to be used in the operations of the Board.

This had nothing to do with whether in the case of the Egg Board the contribution to the Board should be 1d. per dozen. It dealt with the surplus that remained at the end of a Pool period after the producers had been paid for their eggs, after the Board's employees had been paid, and after the members of the Board had drawn their small remuneration. Under the present Act only one halfpenny in every £1 of the net proceeds could be retained as a reserve fund, the balance being returned to the producers. There had been only two Pool periods for eggs up to the present, after the first of which there was a surplus of £24,987. The second Pool period ended on 30th June, 1940, and there was a surplus of £10,000. What has to be determined is how that £10,000 surplus, which the Egg and Egg Pulp Marketing Board had in hand, would be used. The proposed amendment provided that one halfpenny in the £1 of that surplus, or such larger amount as the Governor in Council approved, might be kept by the Board as a reserve fund to carry on its operations during the next Pool period—that is this year.

Parliament has to decide whether the Board should keep only one halfpenny in the £1 of that £10,000, as working capital to carry on its business this year, or whether it should be allowed to retain a larger amount, to be approved by the Governor in Council. The Board would not have the authority to decide that. The amendment proposed in the clause would not in any way affect the Board's present system of paying producers for eggs, as it related only to the distribution of any surplus the Board might have at the end of a season's operations. Nor would the amendment affect the Pool contribution of 1d. a dozen. Under the provisions of the principal Act—and this applied not only to eggs, but to any primary product that comes within the scope of the Act—a Marketing Board for eggs, or chicory, or onions, or maize, which has a surplus at the end of any Pool period, may retain not more than one halfpenny

in the £1 of that surplus to finance its operations during the next season. At the end of the first Pool period, which terminated on 30th June, 1938, the Egg and Egg Pulp Marketing Board had a surplus of £24,987 after paying the producers for their eggs, and wages, rent, and salaries of the members of the Board.

The Board retained as a reserve fund £1,775 of that amount—the maximum amount that it could retain under the terms of the Act—£22,514 being returned to 15,872 producers. Making that distribution involved an expenditure of £357—the cost of cheques, stamp duty, stationery, and postage. That distribution represented one-third of a penny per dozen—that is, one-third of the Pool deduction of 1d. a dozen paid by producers during the Pool period. The final result, therefore, that year was that the Pool contribution paid by the producers in the first year was two-thirds of a penny a dozen, and not one penny a dozen. After making that distribution the Board had a balance of £341. As the Act stood, the Board would be obliged to distribute that amount also among the 15,872 producers, although the expense involved in doing so would be more than the sum to be distributed.

That would be a silly thing to do. It would be much saner to allow the Board, on the authority of the Governor in Council, to retain that amount of £341, or such larger sums as the Governor in Council approved, as working capital to carry on the operations of the Pool. It was bad business for marketing Boards to distribute all their surplus at the end of a Pool period before they had built up an adequate reserve fund to carry on their operations and to provide against future possible losses. Instead of distributing the surplus to producers and maintaining the Pool deduction at the present rate, it would be better for the Board to retain the surplus as a reserve fund and reduce the contribution. The amending Bill provided that the portion of the surplus which the Board might retain as a reserve fund was to be approved by the Governor in Council. The interests of the egg producers would be safeguarded. Approval would not be given by the Governor in Council to the Board to retain more of the surplus than was necessary.

Section 35 of the principal Act provides that no producer of eggs shall, as such, be entitled to vote at any poll or election under the Act unless he is the owner of at least 150 hens. Clause 4 of the amending Bill reduces this requirement to 100 hens.

Opposing an amendment to reduce the qualification to 50 hens and to exclude from the provisions of the Act producers owning less than 50 hens, the Minister of Agriculture said:—

"I have a full knowledge of the subject, and my knowledge was re-inforced as the result of statements made by a deputation which waited on me last week, introduced by the honorable member for Port Fairy and Glenelg. Among the several hundreds of producers present, there were representatives of small, medium, and large producers, but there was no representative from the largest egg producer in the State. Some producers complain about their being taxed without representation, but many who have complained pay no Pool contribution to the Board. Some do not pay because they own fewer than 25 fowls and are exempt from the Pool deduction, but others simply do not pay, although they own more than 150 fowls, have a vote, and derive benefit from the stabilization of egg prices by the Board. Many wage earners and business or professional men keep fowls as a hobby. They have not invested all their capital in the industry, and are not entitled to as much power in deciding whether there should be organized marketing as the person who has invested his all in the industry and is devoting all his time to it.

"The Board desires to assist both the large and small producer, and at present, it is paying 1s. 2d. a dozen for export eggs, and selling them for 1s. 1¾d. a dozen. No other instrumentality in the world will buy something at a higher price than it receives for the sale of that product. Yet the Egg and Egg Pulp Marketing Board is actually doing it at present, and has been doing so for the last month. That is made possible by the 1d. a dozen Pool contribution. Another incorrect argument advanced is that production has decreased because of the operations of the Board. Actually, production has increased by 70 per cent. this year, and last year also there was increased production over the previous year. Many members of the National Utility Poultry Breeders Association own fewer than 150 fowls, and were at the deputation that waited on me last week. They have no vote in elections concerning the Board, but

they do not want any alteration to paragraph (*k*) of section 35 of the Marketing of Primary Products Act.

"Many people who are at present taxed under other legislation have no right to vote. For instance, under the Local Government Act people who have no votes have to pay rates, and we have in the Companies Act a provision that gives shareholders with large holdings more voting power than shareholders with small holdings. If time permitted, I would quote statements made to me by egg producers opposing any reduction in the number of fowls to entitle a producer to vote. They stated irrespective of whether they owned a small number or a large number of birds, that they did not want any alteration in the section of the Act under discussion, and that they approved of the Act and wanted the Board to continue."

Bracken Fern

BRACKEN fern is widespread throughout Gippsland, the western, central, and north-eastern hill land. It is not a proclaimed weed in any part of the State. The Lands Department has not carried out any experimental work in test plots for the control of this plant, but in conjunction with other work several areas have been cleaned up by cultivation, sowing down to pasture and top-dressing; and, in addition, by hand cutting, burning, and sowing in the ash a suitable grass mixture. It is found in practice that only so much of the land as can be maintained should be put under treatment until the pasture is developed.

The bracken should be cut in February and burnt as soon as it is safe to burn. The grass seed and super. should be sown directly in the ash in plenty of time to catch the first autumn rains. Care must be taken not to allow the ferns to develop into the leaf stage. The fronds should be regularly knocked off as they appear with a piece of No. 8 gauge wire or other suitable implement. The grass, thus, is not interfered with and the residue of these fronds acts as a protection to the young plants. In practice it is found that if this procedure is followed over a period of twelve months there will be little trouble in the future control of bracken fern.

Judicious grazing is necessary to enable the pasture to stool and prevent it seeding during the first year. [Extract of report submitted by Mr. E. J. Pemberton, Superintendent of the Vermin and Noxious Weeds Branch of the Lands Department.]

Book Review

"Honey Craft"—J. A. Lawson, F.R.E.S.—(Chapman and Hall, London, 221 pages; English price, 3s. 6d.)

Honey Craft, by J. A. Lawson, represents a useful addition to the literature of bee culture. The publication contains much information for both the hobbyist and the commercial bee farmer, although obviously it is not intended to cover the methods and requirements of the large honey producer.

Written in a manner which may be easily understood by the beginner, much of the matter it contains is interesting also to the advanced student or scientist. The book is clearly based on English methods, and as such cannot be recommended as a text book for Australian honey producers in general, but should be much appreciated by those of us who regard bee-keeping more as an art than an industry.

Photo-sensitization in Sheep and Lambs

By H. M. Elder, B.V.Sc., Veterinary Officer

SHEEP and lambs are frequently affected on the exposed parts of the head with a condition resembling acute sunburn. The first symptom shown is usually a swelling of the face and ears, and sometimes the whole head appears swollen. This swelling then subsides, and the skin on the portions of the face and the backs of the ears, not protected by wool, becomes necrotic or "dead," and gradually develops a scabby or scaly appearance. This affected skin gradually sloughs off, leaving a clean new skin underneath. The swelling of the head frequently develops quickly, and subsides quickly, so that, often, the first symptom noticed is the scaliness of the skin of the face and the backs of ears.

In the majority of cases, the condition is comparatively mild and has little effect on the health of the sheep; but in others it may become very acute. Sometimes the affection is so severe that scabs form right over the nostrils, interfering with breathing, and the animal may even die from suffocation. In other cases, scabs form over the eyes, gumming the eyelids together and causing blindness.

More rarely, the condition may be so severe that the skin of the face and ears becomes red raw, and skin may slough off the top of the head. In some cases, the exposed parts of the legs may become affected. If the trouble becomes acute there is a danger of infection with pus-producing organisms, and the possibility of blow-fly strike must also be considered.

The condition occurs only when sheep are on green feed, and is due to photo-sensitization, or acute sensitivity of the skin to the light rays of the sun. This sensitivity to light is produced by a substance known as phyllo-erythrin, a derivative of chlorophyll, the green colouring matter of plants. This substance is not present in the plant, but is produced as a result of microbial activity during the normal course of digestion, the bacteria present in the rumen or paunch acting on the chlorophyll and forming the phyllo-erythrin. Plants known to cause photo-sensitization in sheep in Victoria are trefoil, St. John's wort, and panicum or summer grass; but even acute cases have occurred on pastures where none of these species are present, and it must be remembered that the condition may be caused by any plant containing chlorophyll, i.e., any green plant.

In some acute cases, jaundice develops and death may ensue. This is more common when sheep have been grazing on panicum. Post-mortem examination reveals typical symptoms of jaundice—the skin and body fat are yellow, the liver is yellow and very crumbly, and the urine is dark in colour. This jaundice must not be confused with toxaemic jaundice or "yellow disease," which is a totally different complaint. Photo-sensitization is also quite distinct from the disease known as "scabby mouth." In this the scabs are confined more to the region around the lips, and they are harder and more raised than those caused by photo-sensitization.

Just as black members of the human race are not susceptible to sunburn, so black sheep and black-faced breeds are not susceptible to photo-sensitization, the black pigment of the skin protecting it from the effect of the sun's rays.

Treatment.

Treatment consists mainly in moving sheep from pasture causing the condition, and putting them in a paddock with ample shade. Affected parts should be dressed with an antiseptic ointment, such as carbolized vaseline, or with an antiseptic oily dressing.

The remainder of the flock may be protected by smearing the exposed parts of the face and ears with an oily or greasy dressing mixed with lamp black. The lamp black has a similar action to the pigment in black skin in protecting the skin from the sun's rays. A strong solution of ordinary washing blue is also a useful protective dressing.

It should be noted that a similar condition frequently occurs in cattle, white or light coloured areas of the skin being affected.

HARVESTING FIBRE FLAX

By A. A. Lee, B.Agr.Sc., Assistant Inspector of Agriculture.

WITH the extension of flax acreage in Victoria from 2,000 acres in 1939 to 12,000 acres in 1940, there will be many growers, now engaged in the industry, who have had no previous experience in harvesting flax. The object of this article is to describe some of the methods which have enabled experienced growers to cut flax with but little more difficulty than is involved in cutting oaten hay. A previous article, "Sowing Flax for Fibre," describes the cultural practices recommended, and it can be obtained in pamphlet form, free of charge, from the Director, Department of Agriculture, Melbourne, C.2.

Summary.

Flax in Victoria is normally cut with a reaper and binder.

The crop should be cut well before it is dead ripe.

The binder should be in good trim, without too much lost motion between driving wheel and knife.

A plain knife in good condition is necessary.

Ledger plates must be in good order.

A simple dividing device can be made to part crops which hang together.

By giving attention to certain essential points, flax can be cut with very little more trouble than oaten hay.

Time of Maturity.

Although it is not the practice in some oversea countries to save seed from the fibre crop, conditions in Victoria are such that the seed represents an important part of the flax crop, and at the same time, high quality fibre is produced. The time to harvest, therefore, should be when the crop is at such a stage that the seed will mature in the stook sufficiently for resowing, and before the dead ripe stage, when the fibre subsequently produced would be harsh and of low quality. This stage of maturity could be referred to as "yellow ripe," as distinct from the earlier green stage when the bolls have formed, but before the seed has grown sufficiently, and distinct also from the later "dead ripe" stage. The variety Liral Crown usually matures before Algerian oats are ready for cutting; but some of the later varieties such as Concurrent, may not be fit to harvest until after the oats.

The actual stage of the crop when the grower should commence cutting is usually decided by consultation with the mill manager, but speaking generally, the crop is ready to harvest when it assumes a brown appearance across the top with the last tinge of yellow disappearing. At

this stage, the earliest seeds may have commenced to rattle in the bolls, and in normal seasons the stems will have turned from green to yellow almost to full height, with the leaves withered to the same extent. On closer examination, it will be found that from one-third to one-half of the bolls will be quite brown with the seeds firm and brown, the remainder of the bolls being light-brown on top but perhaps tinged with green underneath. Experience has shown that the seeds in these slightly immature bolls will mature in the stook.

Fig. 2.—Pulling flax by hand in Europe.

Thus the crop should be taken while the stems are still sappy. It should not be left until the stems are dry and brown, with all the seed rattling in the bolls and some of the seed shedding (see fig. 1). In wet seasons it may be found that the seeds will ripen off while the stems still remain green, and it is then not possible to accurately judge the correct stage of the plant by the colour of the stem. In such cases, harvesting should be commenced as soon as the earliest seeds commence to rattle in the bolls.

With moderate weather conditions, there is usually a period of a week or ten days during which a crop will remain at a suitable stage for harvesting. But growers with large areas of flax should commence cutting on the early side so that the bulk of their crop will be taken at the correct stage.

Fig. 1.—A flax crop in the late yellow ripe stage and definitely ready for cutting.

Methods of Harvesting.

Pulling.

In most other countries where flax is grown for fibre, the crop is pulled either by hand (see figs. 2 and 3) or by flax-pulling machines (see fig. 4). As far as this State is concerned, labour conditions are such that hand pulling

Fig. 3.—Hand pulling flax at Colac, Victoria.

is definitely out of the question, except in specialized cases. Compared with cut flax, a pulled crop may produce an extra 5 cwt. per acre, worth to the grower, at the prevailing rates, an extra £1 5s., but as it would take an experienced man three and a half to four days to pull an acre at a cost of perhaps £3 10s., the proposition would be a losing one, even if sufficient labour were available.

The only type of mechanical flax-puller tried in Victoria has not been a success for various reasons. The efficiency of the actual pulling apparatus was not good, and the machine required three horses and two men to pull a track only 18 inches wide. During the last few years considerable advancement has been made overseas in the type and efficiency of flax-pullers, and it is claimed that the new types of mechanical pullers will pull up to 7 acres per day. It still remains for this improved type of puller to be tried out under our conditions.

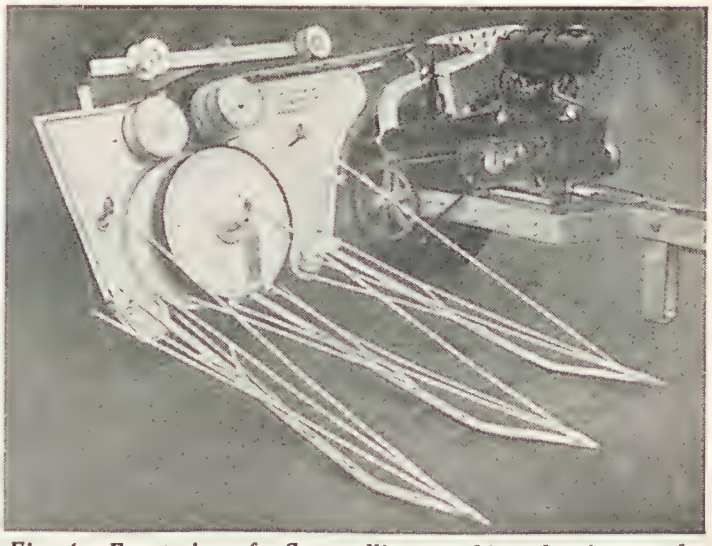


Fig. 4.—Front view of a flax-pulling machine showing combs for lifting lodged flax. These pullers can be fitted with the standard binding mechanism.

Much has been said in favour of pulled flax compared with cut flax, but it has not been demonstrated in Victoria that the quality of the fibre from pulled flax is in any way superior to that from cut flax. Admittedly, a certain length is gained by pulling, but when it is remembered that, in this State, the variety Liral Crown commonly grows from 3 feet to 4 feet high, the gain of a few inches does not assume so much importance as it would in short crops.

It has also been said that the fibre continues into the root, but for all practical purposes, that portion of the root which is pulled up and a short portion of the stem above ground contain no fibre of any use, as this section breaks off with the shives during the after-treatment at the mill.

Fig. 5.—A full cut in a 3 ton crop with a 6 ft. reaper and binder, and three horses.

Fig. 6.—A 10 ft. power driven reaper and binder operating near Birregurra.

Reaper and Binder.

Harvesting flax with the reaper and binder has been adopted as standard practice in Victoria, and as it is usually grown on mixed farms where oaten hay is one of the crops, most flax growers have such an implement at their disposal. The usual type of 6-ft. horse-drawn machine has proved satisfactory (see fig. 5), provided sufficient attention is paid to its operation, details of which will be outlined below. The driving wheel of a horse-drawn 8-ft. machine is inclined to slip if a full cut is taken in a good flax crop, but a power-operated 8-ft. binder would probably be the most satisfactory of all, especially on large areas, provided the ground were even enough. The 10-ft. machine may be rather too wide in some cases for maximum efficiency in cutting low to the ground.

In all cases, the binder must be in good trim without too much lost motion between the driving wheel and the knife, and it must be pulled at a fast even rate. By working four horses with a change of teams in a 6-ft. machine it would be possible to cut over 15 acres in a day, but under normal circumstances 8 to 10 acres represents a good day's cutting. A 10-ft. power-driven binder in the Western District has cut up to 35 acres in a day (see fig. 6).

Knife and Ledger Plates.—As flax is a fibrous crop it is somewhat tougher to cut than oaten hay, and all cutting parts must be in good order. A plain knife is essential, and it must be new or in good condition. An old knife, with the blades bowed and worn to a point, is practically useless for flax, although such a knife may still cut hay satisfactorily. By the same token, too much emphasis cannot be placed on the necessity for the ledger plates being in good order. If they are worn and rounded clean cutting will not be possible. It is essential also for the fingers to be lined up so that the knife will run evenly on all ledger plates, and the knife should be held down snugly but not too tightly.

It will be found necessary to sharpen the knife every two hours or so, and to save time, it is an advantage to keep two knives on the job. Attention should also be given to the pitman, which, if worn, will prevent the knife giving a satisfactory performance.

Some growers have found flax much easier to cut when they have fitted serrated ledger plates, and at the same time have found it unnecessary to sharpen the knife so often. One machine in the Colac district has been fitted with a special low cutting bar which rides on skids in front of its normal position, and so follows the contour of the ground. The cutter bar carries twin fingers and serrated ledger plates in place of the ordinary single type, and leaves a stubble of only 1 inch or so compared with the normal 3 to 4 inches.

Reel and Retarder Strap.—The reel is usually set fairly well back, and high enough to just strike the seed bolls. If the flax is struck too hard, there is a tendency for it to scatter and fall too far back on the platform, and so make an uneven sheaf. Short crops, however, may need slightly more reel.

There seems to be no set position for the retarder strap. Most growers work it where the heads fall, some have it well forward, and others discard it altogether. One grower has found it an advantage to have a second short strap about 18 inches long attached to the bolt in the front inner apron guide to prevent the straw butts or short straw being carried by the slat ends under the platform canvas.

Divider and Grain Wheel.—Some crops appear to divide quite well with the ordinary divider, while in some cases the extra divider,

Fig. 7.—The special divider device which has been used successfully in cutting flax.

similar to that used for lodged oats, has proved an advantage. Many growers, however, have had difficulty with these normal dividers, because the heads of the flax sometimes hold together to such an extent that the uncut crop keeps pulling part of the cut crop back. In these cases, a simple type of divider, as illustrated in fig. 7, has proved quite effective in dividing the crop ahead of the knife so that the cut portion falls cleanly on to the platform without any tangling.

This simple divider is made from a piece of ½-in. galvanized water pipe 10 to 11 feet long and bent in such a fashion that it projects some 2 feet to 2 ft. 6 in. into the crop in front of the ordinary divider, to which it can be attached at the front end by means of bolts through the flattened end of the pipe. It then comes back at a gradual slope until it reaches its maximum height of about 3 ft. 9 in. directly over the knife. The pipe is then rounded back and bolted to the ordinary divider board directly over the crop wheel. This can be achieved by inserting an iron rod well into the end of the pipe before it is bent, and then making a thread to take two nuts, which act as a clamp—one each side of the divider board.

The secret of this divider's success is to have the slope even and not too steep, with the pipe well polished. This allows any heads which are holding together to slide up the pipe and be parted before the flax is cut, and prevents the flax wrapping round the pipe. In very tall crops the height of the divider above the knife would have to be increased, and this adjustment can be made where the pipe is attached to the top of the divider board.

If the flax crop has lodged to any extent, it will be necessary for the front portion of this divider to come to a point close to the ground so that it will exert a lifting effect on the leaning flax. The front portion must then project about 3 ft. 6 in. ahead of the ordinary divider so that the slope will still be gradual enough for the flax to slide up the pipe without any wrapping effect. If the flax then fails to part, the addition of a strip of spring steel sharpened to a knife edge and attached to the top portion of the divider should solve the difficulty.

If trouble is experienced with flax tangling in the grain wheel and getting into the bearing, a sheet of flat iron should be cut to shape and attached to the divider board so that the wheel is completely enclosed. Similarly, it is necessary to watch all bearings, and keep them free from straw, as they will soon run hot if they are allowed to pack up with flax.

Tying and Ejecting the Sheaf.—All canvases should be tight, and no slats should be missing.

The use of the windboard in a sloping position on the binder deck is an advantage, and

Fig. 8.—Well-harvested sheaves of flax in the Strathkellar district.

assists in getting a well-butted sheaf. A medium-sized sheaf is required by the flax mills, and it is usually found necessary to reduce the tension on the trip spring. This will also result in less strain on the binder.

Sheaves should be tied tightly, and in the centre or towards the head of the sheaf (see fig. 8). The knotter should be in good order, with its knife sharp. The third discharge arm is sometimes apt to take hold of straw outside the sheaf being ejected, and this may result in jambing the ejector mechanism. The removal of this third arm often results in neater sheaves and smoother operation of the binder.

Fig. 9—Showing a piece of flat iron attached to the rear deck to prevent sheaves catching in the chain.

Just as the standing crop is difficult to divide, so there is a similar tendency for some of the sheaves to hang together by the heads as they are forced out. If the sheaf carrier is used, this may result in several sheaves remaining attached by their heads, necessitating pulling apart when stooking. On the other hand, if the sheaf carrier is not used, the ejected sheaf may hang on to the flax in the packers and swing round the back of the deck, at the same time pulling some loose flax out of the next sheaf. On some of the older types of binders, this ejected sheaf may then become entangled in the elevator drive chain or the main drive. This may be prevented by attaching a piece of flat iron to the side of the rear deck and bringing it well round to the back of the machine (see fig. 9).

Some growers prefer not to use the sheaf carrier to save the trouble of disentangling the sheaves when stooking, while others use the sheaf carrier without experiencing much trouble.

Stooking.—It usually is necessary to stook the crop for ten days or so before despatch to the mill. If the flax is going to be carted in good time, long stooks two sheaves wide are ideal for drying the flax quickly and evenly, but if the grower is not able to despatch his flax to the mill for some time after harvesting, larger round stooks will keep the flax from drying out too much. It is better, if possible, to deliver the flax to the mill as soon as possible after it has been stooked the requisite time. Should any wild oats be present, it is possible to pull them clean out of the sheaf after the flax has been standing in the stook for a few days, and it is advisable to do this to save dockage for excess weeds.

Too much emphasis cannot be placed on the necessity for care at all times in handling flax. The success of the industry depends largely on the quality and condition of the flax received at the mill, so it behoves every flax grower to do what he can to see that his flax arrives in good condition, at the same time making his flax eligible for the bonuses offered for good quality flax under the contract.

Association Tested Cows

New System of Identification

By W. J. Yuill, Supervisor of Herd Testing

EARLY in the development of the herd-testing movement in Victoria, the need for a sound system of identification of all tested cows became apparent. Where the cows were in small herds and directly under the control of the owner, names served the useful purpose of individualizing the animals, but, where large herds were under test, naming or numbering was useless, unless associated with a brand or permanent mark.

Much attention was given to this question, and, finally, a system suggested by an officer of the Department of Agriculture was adopted. A symbol or letter was allotted to each association unit, together with a number for each herd and each cow. The system has also been used since 1929 for the identification of selected calves which have been registered in the Calf Marking Scheme.

In countries where the herds are small, and the cows housed or tethered for the greater part of their life, the question of identification presents no problem. In New Zealand and Australia, however, where the herds are large and the cows are under control in the sheds only during the actual milking operations, much confusion may occur in the absence of an individualizing brand.

The most important of all reasons for a sound system of identifying herd-test cows is to place the identity of the animal beyond doubt, so that the yields may be credited to the right cow. A further reason is to obviate the difficulty of identification which at times arises, where a change of ownership or management takes place. Names can be applied to any cow, but it is the brand, together with the name, that establishes identity.

During the first phase of herd-recording work, the yield records were used mainly for culling purposes, and for the selection of breeding animals. In what may be termed the second phase, a much greater need for a sound system of identification of all herd-tested cows has become evident, for world-wide attention is now being focused on the importance of sire control—or bull-proving as the work is sometimes called.

If this work is to be received with the confidence it deserves, it is essential that the age and identity of the young cows, and their dams, shall be known with certainty. The basis of the work is a comparison of the age-corrected yields of the mates and daughters of the sire.

New Plan of Identification.

Any system of identification that includes the desirable features of the old method of marking test-cows, and at the same time makes provision for the correct determination of the age, and identity of the tested cow and her dam, must commend itself to all breeders and farmers who practise herd-testing. It will be learned with interest, therefore, by all supporters of the movement, a plan to effectively include all these features has been evolved by a sub-committee of the central council of herd-testing.

Consideration by the sub-committee was given to the value of many systems, such as tail-tags, ear-tags, horn or hoof branding, and the tattooing of the back of the udder. Attention was also given to the objections raised in some quarters to the need for an individualizing brand, as it was thought that the great importance of a sound system of identification had not been fully appreciated. It was agreed, however, that there were a few sincere objections to fire branding cows, which were, in some instances, the pets of the farmer and his family.

Acid branding was also investigated, and found to be satisfactory in the hands of a capable operator. The Danish system of horn branding was obviously useless in a State where dehorning is so widely practised. The hot iron was found to be most commonly used,

particularly where a simple brand was needed, but there appeared to be sound claims for the acid brand where a composite brand, as used on herd-test cows, was being applied.

After exhaustive consideration had been given to the merits of each known system of marking and branding, it was decided that the most desirable form of permanent identification for herd-tested cattle was that of the ear tattoo. This method is the main one used by breed societies of all kinds, the usual practice being to place it in the ear of the animal within a specified time of birth—usually 60 days.

A system of identification of selected calves has been in operation in Victoria since 1929.

The owner's initials or a symbol are usually registered as an owner's mark, together with an individual number for each animal. In the case of calves, these are entered in the calf register, and become the basis of the future identification of the animal concerned.

In the New Zealand group herd test, 10,000 registered cows are accepted on the basis of their tattoo—as are also upwards of 3,000 pure-bred registered cows under association test in Victoria. To this number can now be added all cows tattooed under the marked calf scheme, for although there may be more than one daughter carrying its dam's fire-brand as an ear tattoo, each animal is readily identifiable by the letter representing the year of birth, as for instance, A.6.8.M. ("A" represents the particular association, 6, the number of the herd, 8, the dam's number, and M, the year of the birth of the animal.)

By combining the best features of the old system of branding herd-test cows and the marked calf scheme, there has been evolved a plan that gives far-reaching significance to the individualizing method of identification of herd-test cows.

The new plan provides for the tattooing of any cows that have not so far been branded by fire or acid. It also allows the testing farmer the right to place part of the identification in the cow's ear, as a tattoo, and the remainder on the right neck or thigh as a fire or acid brand, or, as is strongly recommended, the tattooing of the future test cows as calves. This is explained later in the article.

The central council now considers that there can be no reasonable objection to the early completion of test-cow identification. When the new system of tattooing all association test calves is operating throughout the State, greater importance will apply to the district herd-test work, for it will provide the necessary background for extensive sire survey, as practised in northern Europe, Scandinavia, America, and New Zealand.

Basis of Plan.

The new system will operate along lines similar to those on which pure-breed societies work. In New Zealand, much attention has been given to the perfecting of the marked calf scheme, and, in particular, to the method of identifying all such calves.

In New Zealand, each marked calf is tattooed in one ear with its own number and a letter denoting the year of birth, while in the other ear, appears the letter denoting the association and the registered symbol of the calf marking scheme.

All Heifer Calves to be Tattooed.

The Victorian central council of herd-testing proposes to have all calves intended for the herd tattooed during the first year of their life—preferably within a few weeks of birth. When this is done there will be no further need for any other herd-test brand in any association test in Victoria.

The tattoo system which has previously been used only for "marked calves" will now be practised by the whole herd-test movement.

There still remains one essential difference, however, namely, that only such calves as are fully qualified under the *rules of the marked calf scheme* shall carry the letter "H" in a diamond, which is the registered mark of the scheme. By the use of this system it will be seen that the "calf scheme" has suffered no loss, while the herd-test movement has gained an identification scheme of far-reaching importance.

Briefly, the plan provides for the tattooing of *all calves,* with the only identification needed throughout life—as in the case of a registered pure-bred animal. No further branding will be required when the calf subsequently enters the milking herd, and all the tester will need to do, to establish the identity of the individual, will be to check the tattoo in the ears.

In addition to its value for herd-testing purposes, the plan has advantages in other respects. It will prove invaluable for stock-owners, who place their dry cows and growing heifers on agistment for extended periods, for under the scheme no two animals in Victoria will be tattooed with the same marks, and these will be registered in the association records.

The new plan establishes a definite relationship between dams and daughters, and provides information concerning the year of birth. In short, it can be expected that in a few years the scheme will provide much of the confidence now associated with a registered pedigree by making available reliable information of the parents, their production yields, and the age of the animals concerned.

The Cattle Breeding Act, which comes into operation in 1945, demands bulls ex dams with prescribed minimum yields of butter-fat, and the new scheme will be of additional value in providing the necessary identification of the dam.

It is intended that the wider application of the individualizing identification scheme shall begin operation in January next, and, as is the case with the present marked calf scheme, the official year will always commence on 1st January. The first calves to be tattooed under the latter scheme are now over ten years of age, therefore to denote the year of birth, it is proposed to revert to the letter "A" for 1941, and begin the alphabet over again. Each succeeding letter will be used for each year after 1941.

Fig. 1.—The system of fire or acid branding herd test cows as adopted by the Victorian United Cow Test Association.

In this way there will be little or no cost associated with the implementation of the scheme, for the majority of units possesses a tattoo outfit, a set of numerals, and many letters of the alphabet. The most satisfactory material for tattooing has been found to be "Zebra" stove polish. Lamp-black and vaseline also are effective, cheap, and easily obtainable.

It is the practice on some farms to use the "caustic stick" to destroy the "horn buds" and to tattoo the calves at the same time. This usually is done about the fifth to the seventh day after birth, while the calves are still on the tether. In this way, ear sucking which may spoil the tattoo, is largely prevented. It is advisable to keep the animals separated for about a week, after which the tattoo is unlikely to be spoiled, as the punctures heal over in less than that time. If the advice given to testers is faithfully carried out, the tattoo will be permanent throughout the life of the animal.

The individualizing brand of the herd test movement which has been in operation since 1926 is shown in Fig. 1. The example in this case is No. 99 cow in No. 8 herd of the "X"

association. The same identification can be secured by the ear tattoo as shown in Fig. 2.

In each case the animal can be traced to the herd and area where it was under test, thus making it possible to obtain all production records from the association files or the Department of Agriculture.

Fig. 2.—A similar system of identification to that shown in fig. 1, and now accepted as an ear tattoo.

Each calf registered in the marked calf scheme carries in its ear as a tattoo its dam's fire brand, also a letter to denote the year of birth. The "H" in a diamond, which is the symbol of the scheme, is also tattooed in the left ear. A qualified calf from the cow branded similarly to Fig. 2 would be marked as shown in Fig. 3. The full firebrand of the dam is shown in the right ear, and connects the dam and daughter. The letter "P" was tattooed into all calves born in 1940, while the "H" in a diamond shows that the sire was a registered pure-bred whose dam was a known producer.

By combining the best feature of the Victorian United Cow Testing Association tested cow brand with that of the marked calf scheme, the new system of an individualizing identification for all calves has been made possible.

Fig. 3.—Showing the system of identification used in marked calf scheme.

In the new system each calf will be tattooed with *its own number* in the right ear, whereas in the marked calf scheme the dam's number was used. Now the dam's number will be placed in the left ear, together with the letter denoting the year of birth. *All calves* will be tattooed under the new plan, beginning in January next, in the manner shown in Fig. 4.

The example given is calf 109 in number 8 herd of the "X" association, born in year "A" (i.e., 1941), and its dam is No. 99. All that is required to make this calf a fully tattooed one, under the marked calf scheme, is to add the "H" in the diamond to the left ear. The interests of the scheme, therefore, are well safeguarded, as only qualified calves may receive this registered symbol.

It may be thought by some that the ears of a calf are too small to receive so many tatoo items, but the fact that up to six letters and/or figures are commonly tattooed in calves' ears, is sufficient answer to any misgivings on this point. There are, also, numbers of certificated standard herd test cows in this State carrying the crown and up to four figures in one ear, in addition to the calf tattoo identification of the breed society. In New Zealand up to eight letters and/or numerals are tattooed into one ear of cows which have been certificated under the group herd test conditions.

Fig. 4.—The new plan for marking all unregistered heifer calves in the herds of association tested cows.

Tattooing Simpler than Branding.

In fire branding, with the iron heated to cherry red, a practical brander can secure 100 per cent. satisfactory results, but operators, lacking experience, often use the brand too hot or too cold, thereby obtaining indifferent results. When acids are used the inexperienced brander frequently uses too much material, causing some of it to run, giving a blotch brand. Tattooing is simpler than branding, either by fire or acid, but there are some features of this method which require attention if the best results are to be obtained.

Inspection of a cow's ear will show that there are two main ridges of cartilage running lengthwise for about half its length with ample room to tattoo a row of figures between these ridges, as well as above or below them. Usually the top section is preferred, although the area between the ridges is favoured by some operators. Care should be taken not to tattoo across the ridges, or a mutilated ear may result. The haired-over area, near the edge of the ear, should be avoided also.

The majority of tattoo outfits now in use contain three items, and the outside measurement of the "bite" will be found not to exceed 1¾ inches for the large size, and 1⅛ inches for the smaller set. The latter set is recommended for calves, since the tattoo will grow to at least twice the size by the time the cow reaches maturity.

Before proceeding to tattoo, the ear should be wiped out with a kerosene or benzine cloth in order to remove grease, dirt, or wax. An essential precaution at this stage is to "try the bite" on a piece of paper or cardboard before it is placed in the ear. Some operators make the imprint of the needles on the palm of their hand. After having placed all the items correctly in the holder there is still a possibility of making a serious error, namely of working from the top of the ear with letters that were prepared for the bottom position.

Some operators prefer to work from the bottom of the ear. When this is being done the items in the holder should be set up to read from left to right. It will then read correctly when tattooed into the ear. If after having so prepared the tattoo the "bite" is taken from the top of the ear, *a reversed and inverted tattoo will result.* Should this be done, the tattoo must be reported as such.

If the tattoo is prepared for work from the top of the ear, the letters or figures should be placed in the holder in an inverted position and read from right to left. When placed in the ear in this manner the items will appear in the ear correct for normal reading. The needles must be forced right through the ear, and the punctures filled with paste by rubbing it over the tattooed area. Some operators obtain equally good results by rubbing the paste in only on the inside of the ear, but usually it is rubbed over the area before the "bite" is made, and well rubbed in from both sides of the ear after tattooing is completed.

Officers of the Department rarely find indistinct tattooing, but they have found figures or letters, and at times, the whole tattoo reversed. Such errors should not occur if the precautions suggested are kept in mind.

Fewer mistakes will be made by a person constantly engaged in tattooing work than one not used to it, and for this reason some associations pay their herd-tester a fee (usually 3d a head) to tattoo all calves. Under the marked calf scheme no person other than a herd-tester is authorized by the central council to have the custody of the "H" in the diamond, or to place it in the ear of a qualified calf.

The central council desires each association's executive to control the *tattooing of all calves* in their own way, but recommends that the work be done by the herd-tester, the payment for the service to be a domestic arrangement between the executive and the tester. Some breeders who possess a tattoo outfit may desire to do their own work, but it is thought that the small cost of tattooing the number of female calves usually reared on Victorian farms would willingly be paid by members to have their tattooing done each month, as the calves arrive, or as early in the life of the calf as possible.

The important features of this plan to keep in mind are that it fulfills the condition of the subsidy paid by the Government for identification of herd-tested cows. It also provides permanent identity for all purposes —as in the case of registered pure-bred stock— and it prepares the background for the new and very important work of sire surveys.

In discussing the importance of bull indicing work the chief of the Division of Dairy Herd Improvement Investigation of the Bureau of Dairy Industry (J. F. Kendrick) says, "inter alia"—"Because the use of good proved sires, and sons of such sires, is now recognised as the surest and quickest way to improve the inherent producing ability of dairy herds, the Bureau of Dairy Industry and the State extension services are co-operating in a nation-wide programme to prove all sires that are being used in association herds, and to aid in disseminating and perpetuating the influence of outstanding sires. To facilitate this programme the co-operating agencies have inaugurated a system for establishing and recording the identity of every association animal (male and female); and reporting the

production record of all females for permanent recording by the Bureau of Dairy Industry. In general, the objective of the larger programme is to so improve the association herds that they may serve as a source of breeding stock for improving the whole dairy cow population."

This feature is in part embodied in the new Cattle Breeding Act, for recorded dams are demanded for all sires to be used by dairy-farmers after 1944. Sire-control work has greatly developed in all leading dairying countries, and it is not too much to claim that the future development of herd-test work will be mainly associated with testing sires, rather than testing cows, for the possible influence of any sire may well be fifty times greater than that of any cow.

This plan must be superimposed on herd-test work; for the basis of bull indexing, or sire surveys is the comparison of the age-corrected records of the mates and daughters of a sire. The work can only receive full confidence when the age and identity of all animals are above suspicion. The new identification plan put forward by the central council of herd-testing will go a long way towards supplying the necessary confidence.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.
State Research Farm	Werribee	211
Payne, A. E. T. ..	"Yarra View," Lilydale	77
Dennis, Mrs. A. A. ..	Frankston	19
Reid, Ralph G. ..	"Holmwood," Koowee-rup	87
School of Horticulture	Burnley	6
Lawrence, P. H. ..	"Rainga," Tarrawarra	60
Banyule Stud Pty. Ltd.	Heidelberg	63
Black, Miss Grace ..	Mount Noorat ..	35
Black, Estate, Late I. S.	"The Cottage," Mount Noorat	46
Read, Estate, Late John D.	"Springhurst Estate," Springhurst	112
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17
Gorman, A. W. ..	"Cathcart," Alexandra	64
Samuel, B. T. ..	Lang Lang ..	60
Powell, T. S. ..	"Carellen," Mansfield	41
Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	16
Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	31
Onley, W. H. ..	"Glenholme," Caldermeade	52
Payne, T. E. N. ..	"Woodburn," Kilmore	57
Holloway, R. W. ..	Caldermeade ..	54
Dookie Agricultural College	Dookie	81

Raising the Standard of Potato Stocks

By J. T. Ramsay, Potato Expert

Showing the effect of virus diseases on the potato plant. Left—a healthy crop. Right—95 per cent. virus infection.

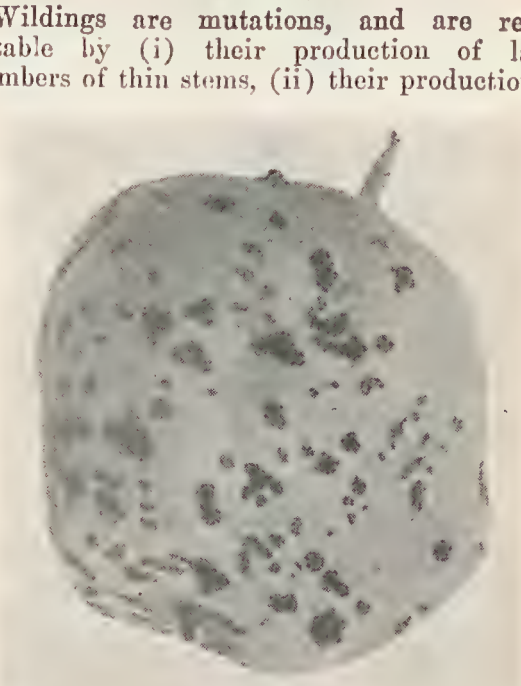
NOW that a seed certification scheme for potatoes has been established in Victoria, a description of variations from correct plant type is given herewith so that growers may be able to recognize plants which should be rogued from the crop.

Boltings or Bolters.

Boltings are variations from the true varietal type. They are detectable by greater height of the plant, more profuse flowering, later maturity and coarser tubers. Normally bolters cannot be distinguished from typical plants until full growth is reached. Bolters are more prone to set berries than the normal plants of the variety in which they occur. For the most part the leaflets of bolters are smaller than normal. They are to be found in varieties such as Epicure, Up-to-Date, and King Edward, all of which are grown more or less extensively in Victoria. The produce of such plants is undesirable and they should be eliminated by rogueing. No evidence is available to prove that bolters are the result of disease.

Wildings.

Wildings are mutations, and are recognizable by (i) their production of large numbers of thin stems, (ii) their production of



A potato tuber showing Rhizoctonia infection.

[Scot. Jnl. Agric.

undersized tubers, (iii) the fact that their flowers generally are unformed, and (iv) the dwarfed appearance of the plant.

The presence of wildings in a crop causes depreciation in yield, and if not culled out they will rapidly increase in the stock, materially reducing its value. There are other variations from normal which, until they are found to be due to some specific disease, must be classed in the same category as bolters and wildings. These show some abnormality of foliage and should be rigorously rogued from the crop.

Potato plants exhibiting symptoms of leaf roll.

Rhizoctonia.

Rhizoctonia, a fungus disease, causes considerable loss to potato crops every year. Its effect on the foliage during the period of growth is readily detected by the dwarfing of the foliage and gnarling of the leaves. In advanced stages the stem of the plant is blackened just at the ground line, and the tubers produced are very numerous but small. This disease may be controlled by dipping seed potatoes in a solution of formalin or mercuric chloride (corrosive sublimate), but as the spores of the fungus can be carried over in the soil, reinfestation may take place on treated seed. Rogueing is the most effective control.

Typical symptoms of Blackleg on a potato plant.

Blackleg.

The bacterial disease commonly known as "blackleg" is caused by the bacillus *Phytophthurus,* and is fairly prevalent in some seasons. It is easily recognized by the symptoms shown by the upcurled leaves instead of the generally horizontal natural growth, and also by the discoloration of the foliage and blackening of the stem below ground. Under favourable conditions this blackening may extend above ground on the stalk as well. The damage done to plants by "blackleg" is relatively small compared with that caused by other diseases, and the trouble may be checked by seed treatment with formalin or corrosive sublimate. In crops intended for seed it is undesirable, and plants showing the characteristic symptoms should be rogued.

Virus Diseases.

There are various forms of virus diseases which are listed under the headings of Leaf Roll, Mild or Severe Mosaic, Crinkle, and Streak. These are the forms most commonly met with. Of late years virus diseases have

Left—a plant affected with mosaic. Right—a healthy plant.
[Dept. Agric. Ireland.

been given much more attention than previously on account of the greater appreciation by breeders and growers of the vast amount of damage done to potato crops in all countries.

It is estimated that, in Australia, the reduction in total yield due to the effect of the various forms of virus is from 25 to 30 per cent. The fundamental fact that should be realized by growers is, that once a plant becomes affected with virus the produce of that plant will be permanently and incurably affected. That fact grasped, the seriousness of the position becomes obvious. Unfortunately no control or cure has been found other than the elimination of infected seed or plants. However, the feasibility of reducing the amount of damage done by rogueing areas specially intended for seed production has already been amply demonstrated. No other method can cope with the trouble.

The virus is carried from affected to clean plants chiefly by the common green aphis. Since, however, the symptoms of the commoner forms of virus are fairly easily detected in the field, it is a comparatively easy matter to reduce, by rogueing, the percentage of infestation — at least on small areas or stud plots. Rogueing should systematically be followed up in crops grown from these areas, and it would appear to be quite practicable to eliminate the trouble in areas of fairly high altitude at least. It is generally considered that high altitudes are not conducive to the efficient transmission of the disease by the aphis.

Leaf Roll.

Leaf roll is recognizable by the upward curling of the leaves. The lower leaves are the first to be affected, the upper portion of the plant showing the symptoms later. The leaves become yellowish in colour and brittle to the touch. In extreme cases the plant becomes dwarfed and eventually dies.

Amongst Victorian commercially grown varieties the Up-to-Date is the most susceptible to leaf roll. The thickening and rolling of the lowest leaves are an invariable external symptom of the infection.

Mosaic.

Mild mosaic is not so readily identifiable as some other forms of virus, but in the more severe forms the symptoms are pronounced. The leaves are irregularly mottled with light-green or yellowish spots and become roughened or crinkled. The markings are more easily picked out in dull weather or when the leaves are shaded. The yield from affected plants is lighter, and generally they mature earlier.

Streak.

Streak is recognizable by the darkening and breaking down of the venations of the leaves. The leaves become spotted, shrivel up, and fall.

Streak disease showing typical symptoms.
[Dept. Agric. Ireland.

Crinkle.

As the name implies, crinkle, is shown by a thickening and crinkling of the leaves. Though not uncommon this type is not so prevalent under Victorian conditions. It is one of the severest forms of virus, however, and plants affected produce but little.

From the foregoing description growers should readily recognize the presence of these various diseases, and if systematic efforts be made in the matter of rogueing and the saving of seed from disease-free crops, a substantial improvement in yields should soon be apparent.

Left—a healthy potato plant. Right—a plant affected with crinkle.
[Min. Agr. and Fish.

Already many growers have purchased certified seed at premium prices, and it will be interesting to follow the performance of this certified seed during next season in the districts to which it has gone.

Rogueing the Potato Crop.

The first opportunity for rogueing occurs when seed is boxed and sprouted. Variations from correct type of tuber and bud may then be noted and the off-type tubers removed.

For seed certification purposes, with respect to varietal purity, the removal of foreign plants should be done immediately the flowers open. Some varieties bloom for short periods only, and unless advantage be taken to rogue foreigners to the variety desired at that stage it may not be possible later to differentiate between the foliages or the tubers. When more than one variety is grown in the same field for seed purposes it is advisable to sow a narrow break between the varieties with some other crop, as turnips, rape, millet, &c. Headlands should not be sown with varieties different from the main field.

As far as varietal purity is concerned, little can be done, in most cases, until the crop is in bloom, because of the difficulty of positively identifying some varieties from the foliage only. In certain varieties, of course, their distinct characteristics of haulm in shape or colour of leaf or the habit of the plant render indentification easy.

Prior to flowering, however, rogueing can be pursued vigorously for the elimination of plants showing symptoms of rhizoctonia, virus, &c. Rogueing should be carried out as far as possible in dull weather as the marking or variations from normal are more easily detected under such conditions. In calculating the percentage of plants away from normal, either as to varietal purity or disease the counts should be taken across the drills either at right angles or diagonally to the direction of the rows as this will be a truer average than taking a count straight along the rows.

Bacon and Pork Pig Competition

Pig Production Recording

By L. A. Downey, H.D.A., Pig Expert

IF Australian pig breeders wish to increase their efficiency in pig production and be in a position to compete satisfactorily with other countries, they must continue their work of genetic improvement beyond present standards. This necessitates the recording of facts and figures based on measurements of production so that there will be more definition of those vague terms quality and productivity in pig breeding. Such records of performance should then be used in conjunction with visual appraisement of breeding pigs. These methods of live stock improvement have been in operation in other countries for long periods, and the time is opportune to initiate similar work in the pig industry of Australia.

The productive capacity of breeding pigs can be valued by progeny testing, in which the following four factors are measured:—

1. Litter production of the sow taken as the total litter weight at eight weeks old. This gives a measure of the sow's prolificacy, milking capacity, mothering ability, and other factors.
2. Rate of growth to slaughtering weight.
3. Economy of food conversion.
4. Carcase quality.

Each of these four factors can be measured, and as they are of equal importance, they should all be taken into consideration when crediting breeding stock with progeny performance records. The use of such records in combination with visual judgment of such factors as character, soundness, and balance of conformation would form a sound basis for judging breeding pigs.

It should be realized when measuring the production of stock that they will give results equal to their full inherited capacity only when they are in the best environment and are healthy.

It is a recommendation of the Australian Committee on Animal Production that "there should be a greater appreciation of commercial requirements by stud pig breeders and judges. This possibly could be brought about by (*a*) placing greater emphasis on purely commercial classes for pork and bacon pigs which should be judged on production and carcase appraisal only. Production in this case consists of a combination of the factors prolificacy, age for weight, and carcase quality; (*b*) when the results of pig-testing stations become available, classes for mature pigs should be judged on type and production. Production here means the appraisal of progeny tests, as obtained by pig-testing stations." Further, the sub-committee on pig production resolved that "when adequately controlled, and particularly when associated with a system of carcase appraisal, litter recording is advantageous."

In Victoria, steps were taken in 1939 to implement a scheme embodying these objectives. The Department of Agriculture submitted a plan to the Royal Agricultural Society with a view to introducing these principles to the pig industry through the medium of a bacon and pork pig competition to be conducted at the Royal Show. The plan was referred to the Victorian branch of the Australian Stud Pig Breeders' Society, and was adopted. It included the recording of litter weight, rate of

growth, and carcase quality. Breeders were invited to nominate litters which would be inspected at birth, weighed when eight weeks old, and finally weighed and valued for carcase quality at the Melbourne Royal Show of 1940. The Victorian branch of the above society decided to allocate to the scheme £59, which in previous years it had donated to the porker and baconer classes at the Melbourne show.

With the cancellation of the show, because of the Defence Department's occupation of the show grounds, it was decided to continue with the plan, and to conduct the final weighing and carcase appraisal, and the exhibition of live pigs and carcases at the Melbourne city abattoirs. The judging was carried out on the 18th and 19th September.

The first essentials of a scheme for live stock improvement, based on records of performance, are the authentic recording of production factors and their issue to owners and other people who are desirous of securing breeding stock with production records as well as pedigrees of ancestry. These factors alone would be sufficient in a scheme of complete pig testing at a central testing station, in which circumstances the accrediting of stock would be dependent on their progeny reaching a certain required standard of production. However, in a plan such as the one under review, where it is desired to use the environment of the show for educational purposes, and to associate production recording with stud pig judging, it was considered desirable to foster the competitive spirit, and offer some financial inducement to breeders to nominate litters. Therefore provision was made for the awarding of seven cash prizes, and Government certificates of performance, in both the porker and baconer classes, provided the entries reached a certain standard.

The uncertainty about the holding of a show, and the creation of labour difficulties on farms due to war conditions, were responsible for a reduction in the number of nominations received. The response, however, was very satisfactory. Thirty-one litters were weighed at eight weeks old, and 23 entries were submitted for final weighing and carcase appraisal.

Each entrant was permitted to nominate up to three litters in the porker and the baconer classes, but only two entries were allowed to each breeder in each class, and an entry for exhibition had to consist of two pigs of the one litter. Either purebred or first-cross pigs were eligible.

Litters were inspected by officers of the Department of Agriculture, and given identification marks as soon as possible after birth. The same officers weighed the litters when they were eight weeks old.

Two sample pigs of each litter were exhibited and weighed at the city abattoirs on the 18th September. One pig was slaughtered and its carcase appraised. The carcase and the live pig remaining in the pen were exhibited on the 19th September.

Scale of Points.

The following scale of points was used in making awards:—

Production points.—One point for every 5 lb. of litter weight at eight weeks old.

Growth points.—The average live weight in lb. of the two pigs comprising the entry on the 18th September, divided by their age, in days, and multiplied by 100.

Carcase points.—Percentage secured on appraisal of carcase:—

	Maximum points.
(*a*) By inspection—	
Hams—well-filled and fine-boned ..	8
Shoulders—light ..	7
Streak—thick, full of lean meat ..	12
(*b*) By measurement—	
Eye muscle of loin—thick	28
Back fat—thickness, correct proportion	20
Body length—in proportion to weight	20
Leg length—short ..	5
Total ..	100

The scale of points was so arranged that the judging was based mainly on measurements, leaving nothing to individual opinion. An endeavour was made to place similar emphasis on each of the three factors, production, growth, and carcase, as it was considered that pigs which measure up fairly well in all of these factors are more desirable than those which are outstanding in one or two factors, but particularly deficient in another. That it is possible to have the three factors highly developed in the one litter is proved by the winning entries in the porker and baconer classes. It is at such a combination of economic production and carcase quality that breeders should aim.

The best performance in the baconer class was the entry of Large Whites, owned by Mr.

J. Rintoul, Glengarry. This entry consisted of a litter of twelve pigs which weighed 445 lb. when eight weeks old. The two pigs from this litter averaged 198½ lb. alive when 178 days old, and the pig selected for slaughter scored the top marks of 72½ per cent. when its carcase was appraised.

In the porker class, Messrs. Trenery and Soderlund, Foster, had the entry with the highest score. It was a Large White litter of twelve which weighed 437 lb. when eight weeks old, and the average live weight of the two pigs exhibited was 114½ lb. when 125 days old, the carcase score of the selected pig being 64 per cent.

The full particulars, including the names of the sires and dams of the pigs entered, are given in the accompanying tables.

Results of Bacon and Pork Pig Competition, 1940.

Bacon Class.

Owner's Name.	Breeding of Litter.	Date Litter Born.	Litter at 8 Weeks.		Average Live Weight of Two Pigs Entered 18.9.40.	Points scored			
			Sexes.	Weight.		Production Points. (1 point for each 5 lb. of Litter Weight.)	Growth Points.	Carcase Points. (Percentage on Appraisal).	Total Points.
				lb.	lb.				
J. Rintoul ..	Highfields Renown 11th Wattlebank Gloria 1st (Large White)	24.3.40	M-6 F-6	445	198½ (178 days)	89	111½	72½	273
J. Rintoul ..	Highfields Renown 11th Wattlebank Gloria 1st (Large White)	24.3.40	M-6 F-6	445	202 (178 days)	89	113½	66	268½
T. M. Noble and Son	Finchley Premier Melton Belle 3rd (Large White)	18.4.40	M-8 F-1	387	188 (153 days)	77½	123	58	258½
I. E. and F. Hawtin.	Rossmoyne Centurian 37th Wara Canadian Lena 4th (Large White x Berkshire)	28.2.40	M-5 F-3	362	211 (203 days)	72½	104	66½	243
Fairchild and Clutterbuck	Coree Wonder 34th Vaucluse Maple 56th (Large White)	23.3.40	M-3 F-4	331	211½ (179 days)	66	118	58½	242½
Fairchild and Clutterbuck	Coree Wonder 34th Vaucluse Maple 56th (Large White)	23.3.40	M-3 F-4	lb. 331	lb. 198 (179 days)	66	110½	63½	240
Alex. Dowie ..	St. Cloud Ducat .. Lewisham Rachael (Tamworth)	10.3.40	M-2 F-9	369	180½ (192 days)	74	94	70½	238½
Trenery and Soderlund	Vaucluse King 2nd .. Promview Ada (Large White)	15.3.40	M-7 F-3	330	194½ (187 days)	66	104	66½	236½
C. T. Harrison ..	Vaucluse Bradbury 14th Rossmoyne Maid 39th (Large White)	28.3.40	M-2 F-7	396	167½ (174 days)	79	96½	59½	235
Trenery and Soderlund	Vaucluse King 2nd .. Promview Engeline 10th (Large White)	7.4.40	M-4 F-5	387	165 (164 days)	77½	100½	56	234
Longerenong Agricultural College	Finchley Banner 37th Longerenong Primrose 45th (Large White)	25.3.40	M-7 F-5	388	177½ (177 days)	77½	100½	50½	228½
Dr. A. R. Haywood	Rossmoyne Ranger 90th Windrest Flighty 3rd (Large White)	9.2.40	M-7 F-3	290	198½ (222 days)	58	89½	63	210½

[*Continued on page 497.*

The Argentine Ant in Victoria

A Report on Survey and Control Measures adopted following its Discovery in Melbourne

By T. W. Hogan, B.Agr.Sc., Assistant Entomologist

THE first record of the Argentine ant (*Iridomyrmex humilis* Mayr.) in Australia was made in September, 1939, when specimens from Balwyn, Victoria, were received by J. Clark, Entomologist, National Museum, Victoria. As this ant is not only a notorious household pest, but also a pest in relation to certain agricultural and horticultural crops in the United States of America, Europe, and Africa, steps were taken by the Department of Agriculture, Victoria, to determine the extent of the infestation and the possibility of controlling or eradicating it.

An immediate survey was made of the Balwyn area and the boundaries of the infestation are outlined on Plan 1. At the same time, trials of the control methods recommended in the United States of America were made on four badly-infested properties at Balwyn, and the Argentine ant was proclaimed as an insect and a disease under the *Vegetation and Vine Diseases Act* 1928 (No. 3797). (See *Victoria Government Gazette*, No. 320, 15th November, 1939.) This Act provides that the Governor in Council may, by Proclamation, order that certain trees, plants, or vegetables shall not be removed from or out of any nursery, orchard, or place within certain boundaries. In the *Gazette* of 13th December, 1939, the Balwyn portion of the city of Camberwell was defined as a prohibited area.

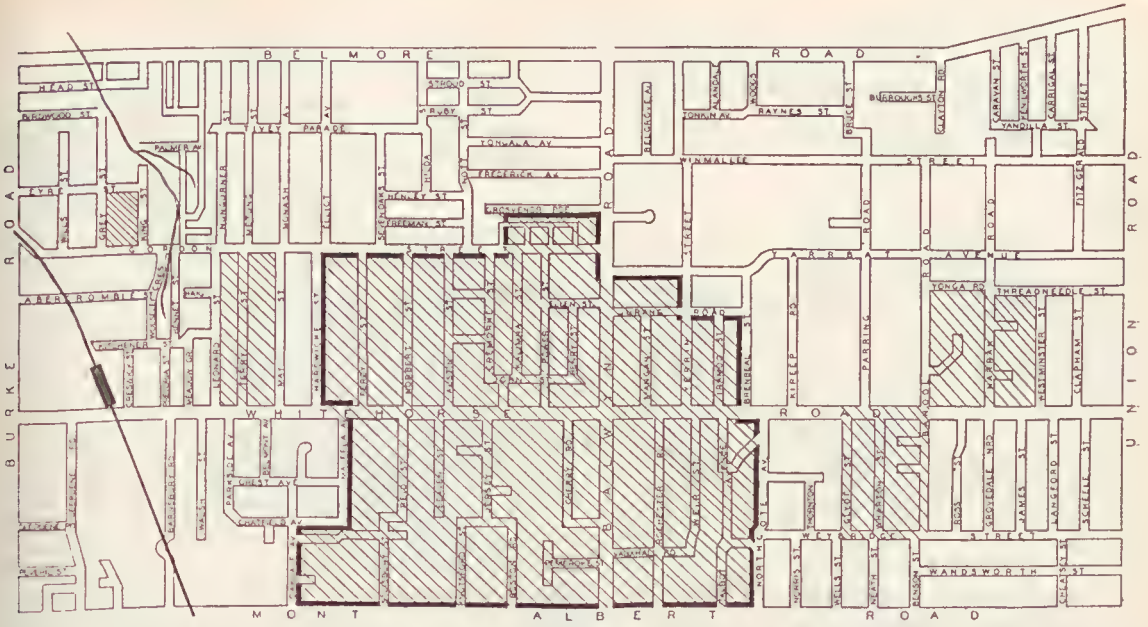
By this means it was hoped to reduce the spread of the pest by human agency. The advisability of this action was shown when Argentine ants were found in a glasshouse at Dandenong belonging to a branch of a Balwyn nursery, and evidently introduced there in pot plants taken from Balwyn. This glasshouse was subsequently fumigated with cyanide and poison baits laid out. Three inspections have been made since, and none of the ants have been found in the glasshouse or its environs. A close watch is being kept on this property to make sure that there are no survivals.

The Argentine ant (worker).
(Magnified approx. 23 times.)

Search for Other Areas of Infestation.—It was considered inadvisable to take further measures against the Balwyn outbreak until it was known definitely whether other areas of infestation existed and, if any, the extent of such infestation. To obtain this information, two courses were decided upon as follows:—

1. A systematic survey of the ant population of the metropolitan area of Melbourne, so designed that any area approaching in size that of Balwyn would be detected.

2. An appeal to the public to report the presence of any ants answering the description of the Argentine ant and the checking of any such report by an entomologist. In this way it was hoped to discover any small outbreak which might be missed by the survey.



Plan 1.—Showing the five proclaimed areas (including the main area outlined in black) where the Argentine ants were first discovered.

Survey.

Survey of the Metropolitan Area.—Samples of the ant population of Melbourne were taken from 464 points in the metropolitan area as shown on Plan 2. As the ant is an introduced one, it was likely to be present only where settlement existed, and, therefore, sampling centres were chosen only after reaching the area that it was proposed to sample. The basis of the plan was that no sampling centre should be more than about half a mile from any other sampling centre. Thus an infestation covering a square, one-quarter of a square mile in extent would be sure of detection.

Ants were collected from the intersection of two roads, at each centre, for a distance of 50 to 200 yards in each of four directions at right angles to one another. The distance over which the collection was made depended on the suitability of the locality for collection. After collecting, the ants were placed in a tube of 80 per cent. alcohol, which was labelled with the date, postal district, and the number of the sample. The same number was then marked on a map of the metropolitan area at the appropriate point.

The presence or absence of the Argentine ant was noted while collecting. The actual collecting was done with the object of obtaining a record of all the more common ants present. The identification of these specimens is proceeding, and will be the subject of a separate report.

Plan 2.—Showing sampling centres of Melbourne ant survey.

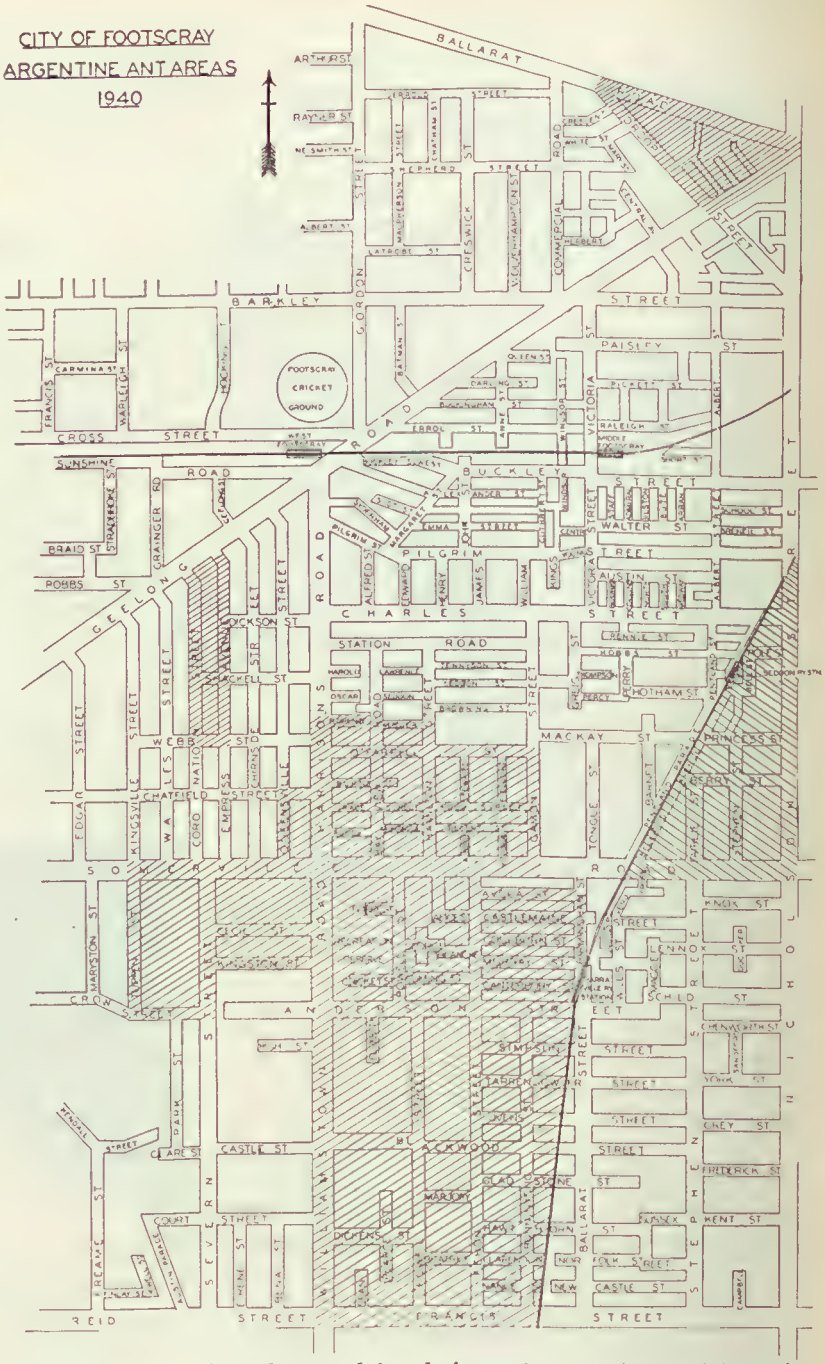
It was found that the survey could be carried out successfully only when the temperature was between 60 deg. F. and 90 deg. F. and on comparatively calm days. Ants were more numerous when the humidity was high.

The survey began on 9th November, 1939, and was completed by 4th March, 1940. It resulted in the discovery of another major infestation at Yarraville, about a quarter of a square mile in area (Plan No. 3). This area was proclaimed in the *Victoria Government Gazette*, No. 5, on 10th January, 1940.

The survey served its main purpose in that it can be said with reasonable certainty that no other outbreak approaching in size that of Balwyn exists in Melbourne apart from Yarraville.

Inspections.

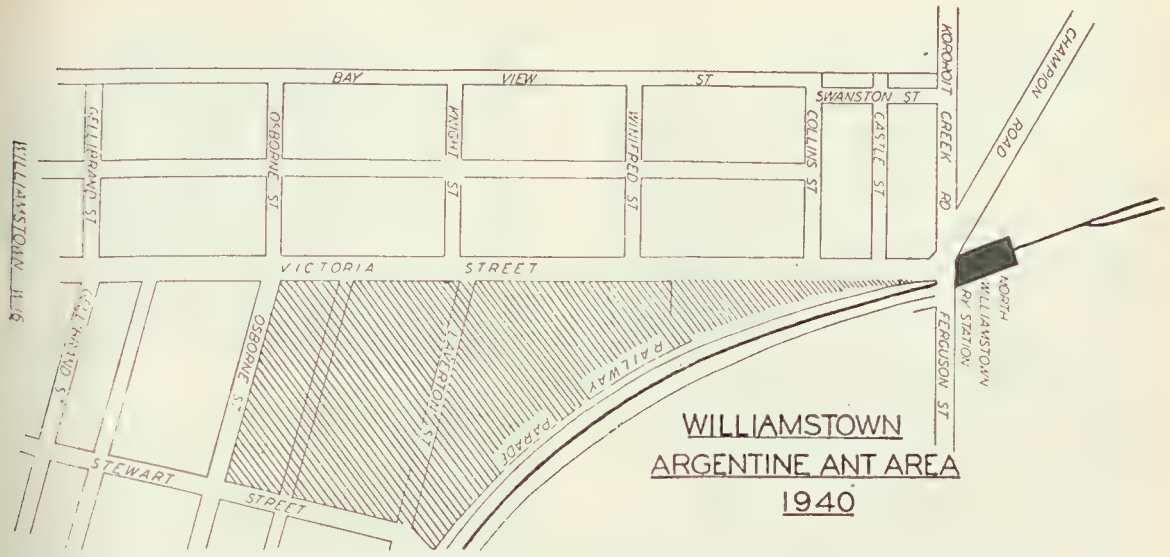
In conjunction with the survey, and continuing afterwards, over 200 inspections have been made of households where ants were reported to be causing trouble. The inspections served two purposes. They resulted in the discovery of thirteen other areas of infestation, most of which were small and may not have been detected by the survey. They served as a means of obtaining first-hand information on the habits of the Argentine ant and other ants, and their economic importance. Information on the habits and control of other species of household ants will be published later.



Plan 3.—Showing the proclaimed Argentine ant areas (shaded) in the city of Footscray.

New Areas of Infestation.

The majority of the new areas of infestation were small and fairly close to the major outbreaks. Five of them were separate from, but close to the main Yarraville area, and four were similarly related to the Balwyn area. Some were sufficiently close to be considered part of the main areas. The remaining four were small areas, one in Williamstown, one in Brunswick, and two in Caulfield. (See Plans 4, 5, 6 and 7.)



Plan 4.—Showing the Williamstown Argentine ant area.

When a new area was discovered the borders of its infestation were plotted out as soon as possible and the area proclaimed. No difficulty was found in defining these areas owing to the fact that, wherever the Argentine ant establishes itself, it drives out all other species of ants, both native and introduced. These areas were proclaimed in the first half of 1940. (See *Government Gazette,* Nos. 5, 22, 109, and 155.)

Information Obtained from Householders.

Much valuable information was obtained from householders regarding the habits of the Argentine ant, its economic importance, and the difficulties likely to be encountered in any scheme of eradication or control.

Habits and Economic Importance.

Descriptions of the habits of the pest varied only in the degree of annoyance caused. Its economic importance seems to be due both to the annoyance caused by the presence of ants in food, clothing, and the house generally, and to damage to food caused by their presence.

The Argentine ant appears to be omnivorous and is attracted to any kind of food, particularly sweets or cooked meat, forming long trails through the house to the food concerned. Although low temperature reduces the activity of the pest, numerous reports were made of the ants entering ice chests and refrigerators. Sometimes even screw-top jars would not keep them out, as the ants followed the thread round to the sweet material in the jar.

They are attracted to flowers, empty tins or bottles previously containing foodstuffs or beverages, and crumbs of food, or even moisture near a sink. Cases were also reported of ants being found in clothing. This was sometimes due to the presence of sweets in a pocket, but not always, and occasionally they seemed to be present in stored clothing and suchlike where there was no foodstuff to attract them. Occasionally they caused great concern by their presence in bedclothes. No cases were reported of ants causing annoyance by biting, although they will sometimes use their mandibles (jaws) to give a sharp pinch when caught in clothing.

Great concern was caused in several cases by ants crawling over babies in basinettes and prams. Actual injury to babies has occurred in the United States of America, but no serious results have followed in local cases. Residents of these dwellings moved out of the area, and many other cases were reported of tenants of houses or flats vacating their dwellings owing to the annoyance caused.

In the garden, the Argentine ant does not damage the plants directly, but, by spreading and protecting aphids, mealy bugs, and scales, causes indirect damage. It was believed by some householders to cause the destruction of flowers on citrus trees, but none of these reports

were substantiated. Similarly, no cases were found of damage being caused to the foundations of buildings or to woodwork.

Remedies Adopted by Householders.

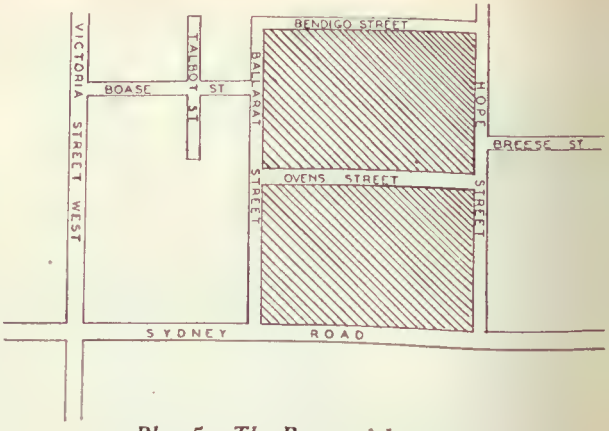
In most cases the measures taken by householders to eradicate this pest were only partially effective. Some spent several shillings a week during the summer on fly sprays and pyrethrum powders. Others were satisfied with pouring boiling water over the ants, wherever they were troublesome. Numerous proprietary ant baits were also tried, but, even where ants were attracted to them, they were not used on a scale likely to affect the ant population. Standing cupboards in water or kerosene was popular, but only partially successful.

The most effective action taken was at Yarraville, where many householders were using honey in which sodium arsenite had been mixed. Little attention was paid to the amount of poison in the mixture, but it did effect some improvement in the position due more to its repellent action than to the actual reduction in population.

Where householders used the bait and methods prescribed by the Department of Agriculture, it was found that in many cases the directions were carried out very inefficiently. This seemed to be due to the fact that most people were acquainted with proprietary brands of ant bait in which small quantities were used in an open container. This was effective for the common black ant, but not for the Argentine ant, owing to the enormous numbers of the latter. Thus, instead of using 50 or 60 containers per property, only one to six were used. Open containers were used instead of lidded ones, so that the baits soon became useless by drying out or becoming dirty. Moreover, instead of cleaning out the container, fresh bait was poured over the old, which caused the new bait to deteriorate much more rapidly. On the other hand, numerous cases in which the bait had been effective were reported by grateful householders.

Demonstration Work at Balwyn.

In order to test the efficacy of American control methods under Australian conditions, demonstration plots were established on four properties at Balwyn where ant infestation was known to be severe. Three of these were in one block in one street and one other in another street.



Plan 5.—The Brunswick area.

Late in November, 1939, quantities of the standard Argentine ant bait, made up according to the United States Government formula, were set out in small tins round each of these properties. The bait was prepared as follows:—

Sugar	1 lb.
Tartaric acid (crystallized) ..	10.3 grains.
Benzoate of soda	14.6 grains.
Water	$\frac{5}{8}$ pint.
Sodium arsenite (chemically pure)	26 grains.
Honey	$2\frac{1}{3}$ oz.

The water was warmed in a clean vessel over a low fire. When it was tepid, the tartaric acid, benzoate of soda, and then the sugar (slowly) were added. The mixture was stirred constantly to prevent burning. The depth of the liquid in the vessel was measured with a stick. The mixture was then brought slowly to the boil and allowed to simmer for 30 to 40 minutes. It was then removed from the stove and water added to the original depth on the measuring stick to make up for evaporation. The honey was then stirred in before the mixture cooled and the sodium arsenite, which had been dissolved in 1.8 fluid oz. of hot water and partially cooled, poured into the syrup.

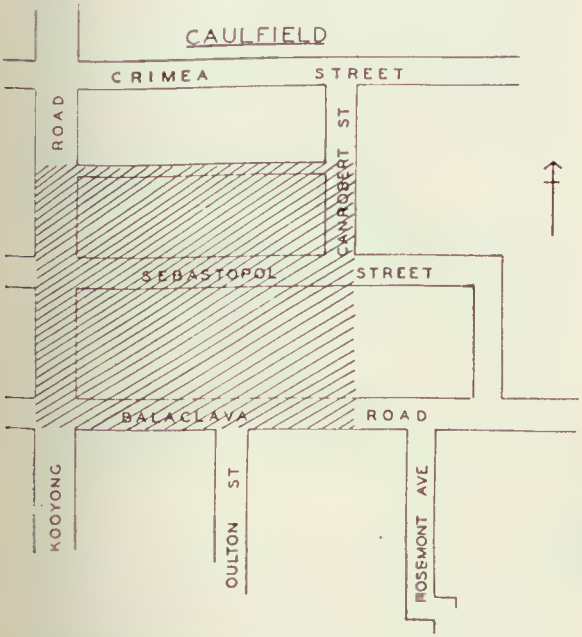
About $1\frac{1}{2}$ to 2 oz. of this bait was used in each container. The containers were tins $3\frac{1}{2}$ inches high by $2\frac{1}{2}$ inches in diameter. (See Fig. 1.) A small quantity of wood wool was placed inside, the top edge bent in, and the lid soldered on and labelled "Poison Bait" on the top. These last two measures were precautionary. The tins were filled on the experimental sites by means of a funnel and a tube. The number required for each block varied from 50 to 85 tins.

The system used in the lay-out of these tins of bait, briefly, was as follows. The house was encircled with tins of bait placed about 10 feet apart, or closer in some parts, for instance, near the kitchen. In addition, other tins were placed around the borders of the property up to 20 feet apart and where it was considered that a concentration of ants was likely to occur. Tins were hung on the sides of gum trees and citrus trees, on the trunks of which numerous trails of ants could be seen during the warm weather, particularly where scale or aphid infestation was present.

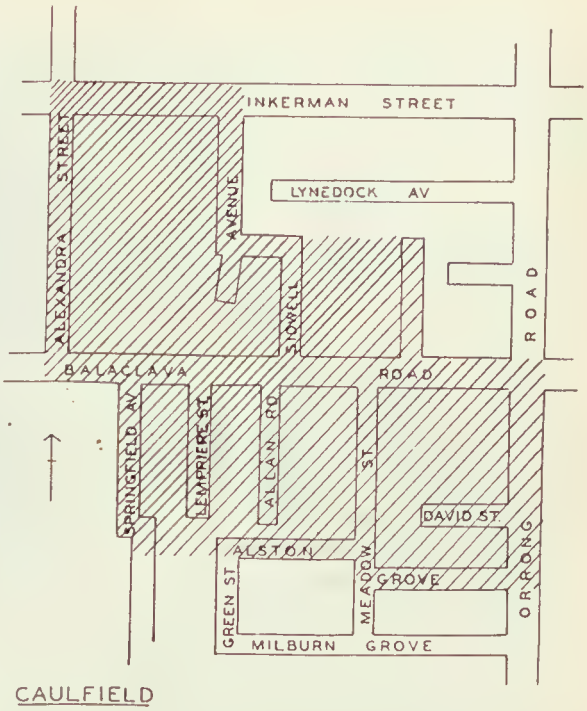
Other favourite points of concentration of the ants were in loose dry soil near a wall; under slabs of material, concrete or wood, lying loose on the soil. They were not found nesting in lawns to any extent, but often near the edge of raised garden patches.

Renewal of Baits.

The first renewal of bait was made towards the end of January, a period of two months from the time of first baiting, by which time the bait had become almost completely crystallized, particularly in situations exposed to the sun. The next renewal was not made till the beginning of May, over three months later. It is considered that the bait will have to be renewed after a further period of three months.



Plan 6.—The first proclaimed Argentine ant area in Caulfield.



Plan 7.—The second Caulfield area.

From observations made in the last series of tests, it is evident that the quantity of bait in the tin is important. The smaller the quantity, the shorter is the period that it lasts. Tests on this point will be made in the coming season. From these tests it is evident that bait will need to be set out at least four times a year to maintain it in a suitable condition continuously. During the cooler parts of the year baits will last three to four months, but only two months or less during the warmer weather.

Results of Treatment.

The effect of the baits was seen at once. Ants ceased to enter the house almost immediately, except in one case. This particular place was ideal for concentration of the ants, in that trees and shrubs were particularly numerous and there were extensive brick and concrete outworks which provided favorable nesting places. Even in this place, however, the numbers of ants entering the house gradually diminished till they ceased altogether.

Reduction in population outside was most noticeable, but it will be possible to judge this aspect more accurately when comparisons are made at the corresponding time of the year this coming season. The most noticeable effect was observed on the single property test, where the baits were set out round a comparatively new

house where shrubs and trees had not become well established. Towards the end of the season ant trails were not even observed in the garden, where formerly they had been numerous.

Dispersion.

All information obtained and observations made up to the present show that the *rate of spread* of the ants by natural expansion from any area is extremely slow. Present experience seems to indicate that accidental transport of ants to new areas by human agency is much more important. As the queen must be present to make such a transfer lead to permanent infestation, potted plants are one of the most likely means of transfer.

At Balwyn particular note was taken of the spread of the ant in one block containing a property as yet uninfested. No appreciable spread took place towards this property from the environs of the houses across uncultivated land or back-yard gardens. There does seem to have been some spread along the row of houses from one house to the next.

It seems likely that spread into new areas does not occur to any great extent until the density of the population within an established area is too great for the food supply or nesting places. It is at this stage, too, that invasions into houses are likely to be most persistent. This would account for the variation in degree of annoyance caused in different parts of the same area of infestation.

In re-defining the Balwyn area last autumn, dispersion across streets was found at several points. In each case they seem to have become well established in the new area. It is likely that they have crossed at other points, but are not sufficiently numerous yet to be noticed.

Garbage Systems.—The danger of transporting the pest to new areas in garbage tins was investigated. Examination of the garbage system at Caulfield and Brunswick showed that, owing to the modern system of collection and incineration in force at these suburbs, there was little possibility of the pest being spread by this means. Examination of the system used in other infested suburbs will be carried out later.

Argentine ant poison bait containers. A.—The type used in experimental work. B.—The new type of container from which the bait cannot be poured out.

New Container.

During the 1939-40 season, lidded tins 3½ inches x 2½ inches, with bent-in tops, were used to hold the poison baits. Some householders are averse to using the bait, however, because it is sweet and they fear that children may be attracted to it and eat some of it. In order to allay any anxiety, a tin has been designed from which the bait cannot be poured out. This is done simply by sealing both ends, and inserting two funnels or small tubes on opposite sides of the tin. The bait can be removed only by violent shaking, which causes it to be scattered widely. Moreover, a small amount of it remains in the tin and cannot be removed even by shaking.

To renew the bait it is necessary to dissolve out the old bait with water and add fresh bait by means of a tube. Alternatively, a new container altogether can be used. The relative efficiency of this type compared with the ordinary tin will be tested this season. The possibility of using other materials instead of tin, of which there may be a shortage, is also being considered.

Commercial Manufacture of Bait.

Up to the present, manufacture of Argentine ant poison bait has been carried out by chemists in the districts concerned. In the majority of cases, this has been faithfully carried out according to the specifications as

recommended by the Department of Agriculture. It has come to our notice, however, that some chemists are adding to the mixture other chemicals which lower the efficiency of the bait.

In order to safeguard the public against this possibility—

"all preparations of poison baits sold, prepared, or offered for sale for the control or eradication of the Argentine ant"—

have, by proclamation in the *Victoria Government Gazette*, No. 280, of 31st July, 1940, been declared to be insecticides for the purposes of the *Fungicides Acts* 1928 and 1935.

The following is an extract from the *Gazette*:—

"And I hereby prescribe the standard for such insecticides to be the standard set out hereunder:—

And I hereby require that the specified constituent of such insecticides as set out hereunder, together with the percentage of such constituent, shall be stated on the label as hereinafter prescribed; and that there shall be attached to every package of such insecticides a label as prescribed hereunder:—

Standard.

All such insecticides shall conform to the following standard:—

(*a*) It shall be a solution in water of sugar, and honey, arsenite of soda, tartaric acid, and benzoate of soda, and shall contain no other ingredient.

(*b*) It shall contain not less than 0.12 per cent., and not more than 0.20 per cent., of sodium arsenite.

(*c*) Its acidity, calculated as tartaric acid, shall not exceed 0.10 per cent.

(*d*) Its solids content shall not be less than 50.0 and not greater than 56.0 deg. Brix.

Constituents the Percentage of which shall be Stated on the Label.

Sodium arsenite.

Label Prescribed.

The label to be used shall have the particulars plainly printed or written thereon with black or other indelible substance, and shall be securely affixed to, branded, or stamped on every package."

From experience gained in the laboratory in the preparation of this poison bait, it seems likely that the main reason for variation in its composition is in the amount of water added to bring the solution back to its previous volume (see directions for preparation). If a container is used with a large surface area, any error in bringing up the volume to the previous mark will be an appreciable proportion of the total volume.

Summary.

Following the discovery of the presence of Argentine ants at Balwyn, a survey of the metropolitan area of Melbourne was made for the purpose of detecting other outbreaks. A description of the methods used and a plan of the sampling centres is given. One other major infestation was discovered.

A system of suburban inspections resulted in the discovery of thirteen minor areas of infestation.

The boundaries of each area were defined and proclaimed in the *Victoria Government Gazette*, making it illegal to remove plants from any of the infested areas.

A small outbreak in a glasshouse at Dandenong is believed to have been eradicated.

Observations have been made on the habits an economic importance of the Argentine ant in Melbourne suburbs. Reports obtained from householders are summarized.

Experimental and demonstrational work has been carried out at Balwyn, and the results indicate that, properly carried out, the methods prescribed are effective in keeping the ants out of the house and in reducing the ant population even in one season. The possibility of complete eradication cannot be judged as yet.

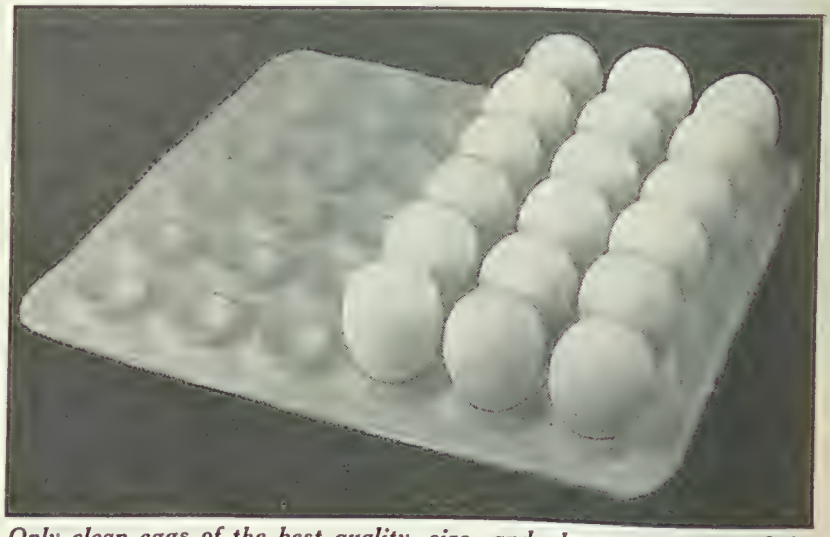
Marketing Eggs

Importance of Cleanliness

By H. F. Clinton, Poultry Expert.

SUCCESS in marketing of any product is dependent to a very large extent on the maintenance of a high standard of quality. This is specially true in the case of eggs, for eggs of inferior quality affect very appreciably the demand and price.

Many factors may affect egg quality. The more important are inferior stock, feeding unsuitable foods, insanitary conditions in housing and accommodation for the birds, unclean conditions, incorrect methods adopted in gathering and packing the eggs, keeping the eggs at high temperature, holding them too long before marketing, and rough handling of the eggs on the farm and during transit.



Only clean eggs of the best quality, size, and shape are accepted for export.

Eggs should be collected at least twice a day, and packed when cool in clean fillers and flats. They must be placed in the fillers with the large end up, and no other material, such as chaff, &c., should be used for packing. The eggs must be kept in a cool and well-ventilated place, free from direct draughts, in order to avoid excessive evaporation, and they should be marketed twice weekly during the warmer period of the year. With the advent of hot weather, these factors should be given careful consideration.

Eggs that are clean and of good shell texture realize higher prices. The shell of an egg is porous, and contact with dirt of any kind endangers the quality of the contents by allowing harmful organisms to penetrate the shell. **Every endeavour should be made to keep eggs clean. It is imperative to adopt clean methods, particularly in the provision of ample nesting material and accommodation. Clean and dry litter must be provided for the floor. Frequent gatherings are essential.**

Eggs which require cleaning should be wiped carefully when cool, after gathering, with a clean damp cloth. Frequent rinsing or changing of the cloth is desirable. The eggs should be properly dried immediately. If the eggs are not cleaned until next day, the operation will be more difficult, and there is likely to be a deterioration in quality. Eggs should not be immersed, as this allows the water, which may contain harmful organisms, to penetrate the shell. **Strict cleanliness in every operation associated with the cleaning of eggs should be adhered to.**

Eggs being of a particularly delicate and fragile nature demand special care at all times. They should be protected against unreasonable handling and transport shocks, in order to avoid damage to the shell and its contents.

It should be realized that eggs exported to the United Kingdom must be of the highest standard, in order to compete with the best quality eggs sent from other parts of the world. This standard demands that the eggs must be of good quality, the right size, spotlessly clean, and of good shape and texture of shell.

The production of *all* eggs of the highest standard is always a difficult problem, but a reasonable degree of uniformity can be obtained by breeding only from the best birds, feeding on correct lines, keeping the birds under sanitary conditions, and by adopting a general system of good management.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

DURING the month of October, the winter flowering annuals should be removed to allow the area to be prepared for the summer annuals. Poppies, calendulas, pansies, and such winter varieties would probably continue to flower for another month or so, but, if they are not removed, it will make the planting for the summer and autumn display too late. Sowings may be made of any of the following:—Aster, zinnia, marigold, bonfire salvia, geum, antirrhinum, petunia, gaillardia, scabious, and carnation. Plant phlox, mignonette, and larkspur in their permanent positions, as they do better this way than when they are transplanted. Prepare the area for dahlias and gladioli, and make a planting of them in November.

Dahlias for planting this season should be ordered now to ensure obtaining the desired varieties before they are sold out. Dahlias may be obtained from seed, cuttings, or division of tubers. They do not come true to type from seed, however, but if the seed is selected carefully, some fairly good plants are sometimes obtained. Nevertheless, growing from seed by amateurs is not recommended, because all types and colours are produced, and it is not possible to plant for decorative effect. Production of dahlias from seed is mainly the practice of the plant breeder who uses it in an endeavour to obtain new varieties.

The usual method used by nurserymen for propagating dahlias is from cuttings. More than 90 per cent. of the plants sold are propagated in this way. Plants from cuttings produce blooms equal to those from tubers, and, when flowering, it is not possible to distinguish one from the other.

To obtain cuttings, the tubers are placed on a light soil and partly covered. The soil is not allowed to dry out. In the nurseries this is done in a glasshouse, but if only a few cuttings are required a glass frame is satisfactory. The tubers are usually "put down" in August and September, and in about one month the shoots are large enough for cuttings. The cutting is taken off about a quarter of an inch above the tuber, trimmed up, and placed in propagating sand, about twelve cuttings per 5-in. pot being used. A bell jar may be placed over each pot of cuttings, or they may be placed in a close frame with a little bottom heat, and in about four weeks they should have rooted. The cuttings are then placed separately into 3½-in. pots, and in two or three weeks they are ready for planting. It is possible to obtain up to about 60 plants from one dahlia clump.

When planting out put the stake in first. One or two plants may be planted per stake. Invert the pot, holding the hand over the mouth, give it a sharp knock, and the plant should come out with the soil intact. It is then planted about the same depth as it was in the pot, the soil being consolidated leaving a slight depression. Give a thorough watering, and if the weather is hot place a twig on the north side to shelter the plant until it becomes established. When it is large enough it should be tied to the stake. The young plant needs careful treatment for the first three or four weeks and then the treatment is the same as for those produced from planting tubers.

When planting tubers, place them at a slant, with the bud near the stake and about 2 inches below the surface. The opposite end of the tuber will be about 4 inches below. Have the soil moist when planting and the tubers should require no further attention until they are well above ground.

When well established, give them a dressing of market garden manure, scattered well over the area, and forked in lightly. Then give the plants a good watering. If possible, mulch them with stable manure containing a good deal of straw. This enables the watering and necessary attention to be given without puddling the surface soil. Tie plants to the stakes and disbud as required to enable blooms with longer stalks to be produced. To avoid flowering in the very hot weather, plant about the second week in December. They should then flower in late February and carry on until the frost nips them back.

Vegetables.

October is the month to sow most summer vegetables, especially those which are susceptible to frost, and further plantings of peas, lettuce, radish, turnip, parsnip, and French beans may be made. Sow seeds of the climbing bean, pumpkin, melon, and cucumber. Transplant tomato, lettuce, and cape gooseberry.

The melon family is important from both a dessert and culinary viewpoint. The citron

or preserving melon is used for jam making and for pies, and the flesh of these varieties remains firm when cooked. Melon jam is an Australian product, and when flavoured with pineapple or passion fruit is very appetizing, and is becoming popular in other countries. The varieties mentioned are hardier than most other melons, and may be grown in almost any part of Victoria if a little water is available in the less favoured rainfall areas.

The seeds are sown in threes, about 6 feet apart in the rows, and with 6 feet between the rows. As soon as the plants are established, a little farm yard manure should be placed around them, as this helps to keep the moisture in the soil. When runners are about 1 yard long, pinch off the ends, as this tends to make the fruit set better.

Cantaloupe, rock melon, or musk melon, may be distinguished from other varieties of melon by their musk flavour, and they often have distinct markings on the skin. These melons are treated much the same as the citron, but the seeds should be planted about 4 feet apart. When ripe, the musk aroma is very evident. They should be picked two or three days before using and put in a cool place. The Matchless variety has a distinct netted skin with firm flesh of a golden colour, and it is one of the best. Fordhook is a favourite with salmon-coloured flesh, and Cantaloupe Yellow is one of the most popular.

Orchard Notes

By J. L. Provan, B.Agr.Sc. Senior Horticultural Instructor

OCTOBER is an important month for the control of codling moth of pears. The majority of the mid-season and later flowering varieties of pears complete their blossoming periods, and the calyx spray of arsenate of lead should be applied before the calyx closes and the pears begin to droop. Normally, from two to three weeks should elapse from the time of "petal fall" until the period of spraying. The arsenate of lead spray can be delayed until such time as the calyx is still open and the fruit erect.

As a large percentage of codling moth infection of pears occurs either through or near the calyx, it is very important that a good coverage of arsenate of lead be given at this stage. The addition of a small amount of white oil—say half a gallon in 80 of water—or an efficient spreader will assist in the wetting and coverage of the calyx end of the developing fruit. The calyces should be examined to ascertain how thorough the application has been. The use of rods and the direction of the spray downwards and into the calyces assist in obtaining a good coverage of the fruit at this stage.

For many years Emperor mandarins have been arriving on the Melbourne market in a somewhat crushed condition, and steps have been taken to remedy this. The long bushel case (26 in. x 6 in. x 14¼ in. inside measurements clear of the division) is now being used, and a new mandarin packing chart has been drawn up for distribution to growers and packing houses. Copies of this chart may be obtained, on application, from the Director, Department of Agriculture, Melbourne, C.2.

The late-flowering cherries complete their blossoming period early this month. Bigarreau Napoleon, Florence, St. Margaret, Windsor, and Black Boy are good inter-pollinators for each other. The cherry tree requires cross-pollination, and it is very necessary to provide for the pollen of synchronous blooming varieties for this purpose. This can be provided by either placing the blossoms in the trees as a temporary measure, or in the more permanent form of budding, or grafting suitable varieties on to the trees to be pollinated. This will provide pollen for future years, but is, of course, not of any value for the first or second year after the work is completed.

Nicotine sulphate, 1 pint in 80 gallons, plus 2 lb. of soft soap, will be found a very effective spray for the control of aphis at this period of the year. It is important that the spray should be applied before the insects become too numerous, and certainly before very much curling of the leaves takes place. The curling of the leaves shelters the insects from contact with the spray and makes control very difficult.

If the pear and cherry slug is also present on cherry trees, an arsenate of lead spray, 2 lb. (paste) in 80 gallons of water, plus 1 lb. of calcium caseinate spreader, can be added to the nicotine sulphate, but, if this is done, the soft soap should be omitted from the combined spray. It is advisable to apply a lead spray before the fruit is half grown, otherwise the residue problem will have to be faced when the

fruit is harvested. If a late infestation of pear and cherry slug occurs control by arsenate of lead sprays should be postponed until after harvesting.

For the control of brown rot of peaches, the usual dry-mix lime sulphur spray, 25 lb. in 100 gallons, should be applied when the "stockings" fall from the developing fruit. If necessary, nicotine sulphate, 1 pint in 80 gallons, can be combined with the dry-mix lime sulphur for the control of green and black peach aphis at this time of the year. The early control measures are usually the most effective to deal with these pests.

Codling moth lures should be in position on the trees about the middle of the month. The most effective lure is the 10 per cent. solution of sweet wine (of the port type) or sweet wine lees may be used. The latter substance is the dark-coloured liquid which remains in the wine vats after the bulk of the clear wine has been racked off. Apple juice or vinegar at the same dilution may also be used.

It is proposed this year to continue the departmental spray advisory services in connexion with the codling moth in the apple and pear districts, and growers who are experiencing difficulty in the control of this pest are requested to communicate with their local orchard supervisor, or write direct to the Superintendent of Horticulture, Department of Agriculture, Melbourne, C.2.

Results of Bacon and Pork Pig Competition, 1940—*(Continued from page 485).*

Porker Class.

Owner's Name.	Breeding of Litter.	Date Litter Born.	Litter at 8 Weeks.		Average Live Weight of Two Pigs Entered 18.9.40.	Points scored			
			Sexes.	Weight.		Production Points. (1 point for each 5 lb. of Litter Weight.)	Growth Points.	Carcase Points. (Percentage on Appraisal.)	Total Points.
				lb.	lb.				
Trenery and Soderlund	Promview Banner 5th Promview Engeline 60th (Large White)	16.5.40	M-8 F-4	437	114½ (125 days)	87½	91½	64	243
J. Rintoul ..	Highfields Renown 11th Wattlebank Dainty Girl 5th (Large White)	15.6.40	M-8 F-4	434½	90 (95 days)	87	95	59	241
Longerenong Agricultural College	Promview King 105th Longerenong Pearl 15th (Large White x Middle White)	22.5.40	M-1 F-7	279	116 (119 days)	56	97½	72	225½
Longerenong Agricultural College	Promview King 105th Longerenong Pearl 15th (Large White x Middle White)	22.5.40	M-1 F-7	279	113 (119 days)	56	95	72½	223½
I. E. and F. Hawtin	Ingleside Canadian Emblem 2nd Rossmoyne Sunray 2nd (Berkshire)	20.5.40	M-4 F-3	304	92½ (121 days)	61	76½	67	204½
J. A. Tagell and Sons	Granton Duke Keddies Hill Myrna (Middle White)	14.6.40	M-5 F-5	272	69 (96 days)	54½	72	64½	191
C. T. Harrison ..	Eastside Bridegroom 4th Eastside Beautiful 5th (Large White)	16.5.40	M-2 F-3	202	102½ (125 days)	40½	82	64½	187
Trenery and Soderlund	Promview Eddie Promview Superior 3rd (Large White)	15.6.40	M-6 F-3	288	67½ (95 days)	57½	71	56½	185
J. J. Baker ..	Rosedale Demon Rosedale Mimi (Middle White)	3.4.40	M-2 F-5	212	103½ (168 days)	42½	61½	68½	172½
Dr. A. R. Haywood	Kinilabah Airman Windrest Wallis 2nd (Berkshire)	27.5.40	M-1 F-5	172	75 (114 days)	34½	66	59	159½
Dr. A. R. Haywood	Kinilabah Airman Windrest Dainty (Berkshire)	13.5.40	M-5 F-2	160	74½ (128 days)	32	58	61	151

Grass Tetany in Cows

By N. Sjogren, B.V.Sc., Veterinary Officer

GRASS Tetany, Lactation Tetany, or as it is commonly known in Victoria, "Pasture Poisoning," is a disease which occurs mainly in dairy cows a few weeks after calving, but cases have been reported in dry cows, heifers and even male animals. There has been a marked increase in its incidence during the last few years and, although it has occupied the attention of research workers all over the world, its actual cause still remains a problem.

Symptoms.

Two types of the disease have been recognized—acute and subacute. In the acute type the onset of the disease is so rapid that nothing unusual is noticed before the animal is found down and unable to rise. The breathing is rapid, the muscles twitch, there is clamping of the jaws, and a state of intense excitement often to the stage of convulsions. Death usually occurs in a few hours, sometimes in a few minutes.

In the subacute form the first symptoms are nervousness and anxiety, twitching of muscles, loss of appetite, and striking heavily with all four feet. The animal alternately falls down and gets up with a jerk, or fails to rise at all. Some affected animals froth at the mouth and bellow, and the pupils of the eyes contract. Some appear to be blind and will run against walls, fences or trees. There is a throbbing pulsation of the heart which can be distinctly heard. After the animal has fallen down the violent movements of the limbs continue, and it dies in convulsions. The death rate varies greatly. In some cases death occurs in two days, in others recovery takes place after the animals have been down several days. Some apparently mild cases persist and end fatally, while others which seem more acute recover rapidly.

Grass tetany generally occurs in cows running on good luscious pasture or on a crop of green oats which is not balanced by a supplement of hay or some other roughage. The farmer often mistakes the disease for milk fever and is puzzled when the animal does not respond to treatment such as calcium borogluconate injection or udder inflation. In milk fever, which usually occurs within a day of two after calving, the animal is drowsy, dull and has a dreamy look, and when down, it goes into a coma. These symptoms are entirely different from the excitability and convulsions of grass tetany.

Post-mortem examinations of cows which have died from grass tetany do not reveal any marked abnormality. There are usually small haemorrhages in the inner lining of the heart, in the membrane which surrounds the heart, and in the tissues lining the body cavities and covering the bowels. The liver is usually pale in colour, has thickened edges and is very friable. In fact, the post-mortem picture greatly resembles that seen in entero-toxaemia of sheep.

Cause.

It has been found that in most cases of grass tetany there is a deficiency of magnesium in the blood supply of affected cows, and success has followed the administration of magnesium in the form of magnesium sulphate (Epsom salts). The two elements, calcium and magnesium, are together associated in the normal functioning of the whole system and different symptoms depend on the calcium magnesium ratio. If the calcium is low, milk fever occurs; if the magnesium is low grass tetany occurs.

This does not mean that the animal itself is short of these elements, but that the onset of lactation and other factors have caused a disturbance in the normal functioning of some of the glands which make these elements available in the blood supply. Calcium, for instance, is stored in the bones of the animal and it is mainly the parathyroid gland which is concerned in drawing on this store when the calcium in the blood falls to a low level, such as in the sudden onset of lactation after calving. In grass tetany not only is the magnesium content below normal but often the calcium and phosphorus contents, too, are subnormal.

Prevention.

Preventive measures should aim at keeping all glands functioning normally. The rapid spring growth of pasture or oats, &c., should be supplemented with hay or chaff. It is noticeable that cows, after a day or two on a green oat crop, are soon fossicking after coarse herbage around the headlands and the fences. The rich green growth has a high protein content and roughage must be added to make a balanced ration. The cow's system is subjected to a severe strain in providing the requirements of a rapidly-growing calf and then a heavy lactation.

In most dairying districts the feeding and care of dry cows and springers is greatly neglected, particularly when the high production of many cows is considered. Besides a ration, balanced in protein, carbohydrate, fat and fibre, there must be sufficient minerals. A lick of di-calcic phosphate, salt and molasses should be available at all times. Further, during pregnancy, and particularly before and after calving, drenches of magnesium sulphate and molasses or treacle should be given. Treacle and molasses have both a high calcium and a high magnesium content, as well as a laxative action.

Treatment.

When cases of grass tetany do occur, and provided the animal is able to swallow readily, give a drench of 1½ lb. Epsom salts and ½ lb. treacle in 1 quart of warm water. Do not force the drench, as there is then a great danger of causing pneumonia, or even choking, if some of the fluid goes down the trachea into the lungs instead of being swallowed into the stomachs.

A better method of administering the magnesium is by hypodermic injection. Inject 8 oz. of a 25 per cent. solution of magnesium sulphate under the skin and repeat in a few hours. Farmers who have had experience in the calcium treatment for milk fever are quite capable of doing this. If calcium has been injected, choose another site for the magnesium.

If possible, the services of a veterinary practitioner should be obtained, for not only will he administer the necessary drugs intravenously (i.e., direct into a vein) and thereby obtain quicker results, but also he will administer the correct drugs according to the symptoms shown. When the animal is in a coma as in milk fever, administration of magnesium would aggravate the condition, for already the magnesium in the blood is high—calcium alone should be given in such cases. On the other hand, when calcium has been given and the cow does not respond, particularly if she shows some excitement rather than drowsiness, then magnesium should be given. In other words, if there is drowsiness and unconsciousness give calcium; if there is excitability and convulsions give magnesium.

In conclusion, it should be mentioned that the toxin of entero-toxaemia has been found, recently, in the intestines of cows suffering from grass tetany. Therefore, farmers who have had losses from grass tetany in other years, are advised to vaccinate their cows with entero-toxaemia vaccine (the alum-precipitated vaccine prepared by the Commonwealth Serum Laboratories, Parkville, N.2, is recommended), in doses of 10 cc. and 20 cc. at one month's interval, in an endeavour to establish immunity.

Eelworm on Potatoes

In certain districts in the State eelworms cause a considerable amount of damage to potatoes. They are found on crops in all classes of soil, whether virgin or otherwise, but most favorable conditions occur in well-drained lands. The damage to a crop is caused by the female, which is scarcely visible to the naked eye.

Affected tubers are easily detected by the cysts formed, generally in clusters, on the skin of the tubers. These cysts break down later, and form a scab which, without miscroscopic examination, is not readily distinguishable from other causative agents of scab.

As control of damage by chemical treatment is not economically practicable, the only recommendation that can be made is, as far as possible, to use seed free from eelworm. Rotation of crops is also advisable, so that potatoes will not be planted in the same soil oftener than once in four or five years. The reason for the effectiveness of rotational practice is that the eelworm changes its host plant only with difficulty, and when rotation is practised, the worms are starved out in large numbers before they can adapt themselves to a new plant.

Live Stock Notes

Reminders for October—November

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Minerals for Stock.

(Previous reference to minerals for stock appeared in the June, July, and September issues of this Journal)

THERE are at least thirteen minerals necessary for normal animal growth. Reference has already been made to sodium, chlorine, calcium, and phosphorus. The remaining minerals are sulphur, potassium, magnesium, iron, copper, cobalt, iodine, manganese, and zinc, but it is only rarely that any of these are deficient in rations.

Sulphur.

Sulphur is found in the animal body as an essential constituent of sulpho-proteins which form skin, horn, hoof, hair, wool, and fur. Apparently the only function of sulphur is as sulpho-protein, and animals can assimilate it only as such.

When sulpho-proteins are used in metabolism (i.e., the process by which food material is assimilated for growth production and replacement of waste incidental to life), sulphuric acid is formed, and this has to be neutralized by one of the bases, usually lime or potash, and excreted. There is no evidence to suggest that animals can use sulphur in an inorganic form, and, when added to a lick, it is excreted without being assimilated.

Potassium.

Potassium is present in large quantities in most foodstuffs in the form of inorganic salts. Potash is more evenly distributed throughout plants than calcium, although, like calcium, larger percentages are found in the leaves and stalks than in the grain and fruit.

Large amounts of potash are used by animals, but, as most plants contain liberal quantities, deficiencies in the diet have not been reported. In the animal, potash is found mostly in the muscles, where it is used to neutralize phosphoric and sulphuric acids from the metabolism of proteins. Excess potash in the food causes a loss of soda which is very frequently deficient unless licks of common salt are provided. Rations should contain from five to ten times as much potash as soda.

Magnesium.

Magnesium has definite functions to perform in stimulating the circulation of the blood and neutralizing acids. Deficiencies of this element are associated with convulsions. Nevertheless, magnesium has toxic properties as well as beneficial ones, especially if there is not between two and three times more lime than magnesium present in the rations. Deficiencies of magnesium are very rare.

The bases, calcium, magnesium, potassium, and sodium, should not only be present in rations in certain ratios with one another, but they must also be present in such a balance with the acids (phosphoric, sulphuric, and hydrochloric) that a considerable excess of the bases is present. Soda and lime are frequently deficient in rations, and can be supplied by licks of common salt and powdered limestone. Phosphoric acid, when deficient, can be supplied by adding bone flour to the licks. Other acids, and the bases, potash and magnesia, are very rarely deficient in rations.

Iron, Copper, and Cobalt.

The absence of either iron, copper, or cobalt is connected with anaemia, wasting, unthriftiness, impaired growth, loss of appetite, &c. Iron is an essential constituent of the haemoglobin (red colouring matter) of the blood, while copper and cobalt are essential for the formation of haemoglobin. It is generally known that haemoglobin absorbs oxygen which is breathed into the lungs, and carries this oxygen to all parts of the body, where it is used for metabolic purposes.

Under natural conditions iron deficiency rarely, if ever, occurs, but some foods such as milk and milk by-products contain very little iron, and deficiencies of iron are known to occur amongst housed and milk-fed stock. Iron deficiencies can nearly always be corrected, either by turning the stock out on to pasture, or, if this is not possible, sods of earth should be placed in the sties, stalls, or fowl houses for the stock to eat. Nearly all soils contain large quantities of iron.

Sucking pigs housed without access to soil or pasture are prone to anaemia. This anaemia can be cured by running the pigs on pasture, or by placing a fresh sod of turf in the sty each day, as already stated, but if this is not possible, each pigling should be dosed on the sixth day after birth with 5 grains of reduced iron (ferrum reductum). Five grains of reduced iron will just cover a threepenny bit, and this amount should be placed on the back of the tongue. It has been found that the iron content of milk cannot be increased by feeding iron compounds to the sow, cow, or other lactating animal.

In a few coastal areas of Victoria, copper and cobalt are deficient in the soil, and stock grazed on these areas develop what is known as "coast disease." Particulars for correcting copper and cobalt deficiencies, and curing "coast disease," will be supplied on application to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

The amounts of copper and cobalt required by stock are too infinitesimal to be appreciated by the average person. One-hundredth part of an ounce of cobalt and a two-hundredth part of an ounce of copper apparently supply the full requirements of one sheep for twelve months. The minutest traces are, therefore, required daily, but these traces, which are normally supplied in the foodstuffs, have a tremendous effect on the vigour and health of the stock. The "trace" elements, such as copper and cobalt, are required in very small amounts, and, conversely, more than the required amount may be actually deleterious. Therefore, unless copper is required by the stock, licks containing copper may be extremely dangerous. For instance, sheep receiving very small overdoses of copper daily are very susceptible to attacks of jaundice.

Iodine, Manganese, and Zinc.

As far as is known, iodine, manganese, and zinc are not deficient in rations usually received by Victorian live stock, and no benefits are obtained by adding them to licks.

Iodine is associated with the activity of the thyroid glands which secrete substances to stimulate growth and production.

In other countries, manganese has been found to be necessary for normal reproduction, and to prevent a disease in poultry known as "slipped tendon." Manganese salts are sometimes added to stock licks, but manganese is used by animals in the merest traces only. Excess manganese in the pasture or licks has been attributed to the lowering of blood magnesium, and thereby causing lactation or grass tetany in dairy cows. Unless advised by the Superintendent of Live Stock, stockowners should avoid licks containing manganese salts.

The functions of zinc are not clearly known, and deficiencies have only been reported in artificially-fed laboratory animals.

Dairy Cattle.

The Government of Great Britain has indicated that it requires increased supplies of dairy produce, butter, cheese, dried and condensed milk, &c. Dairy farmers, therefore, can best serve their country by endeavouring to obtain the highest possible production from their herds.

The Department of Agriculture has on its staff officers who have specialized in the feeding, breeding, health and disease of farm animals, herd testing, hygiene, pasture improvement, and fodder conservation. Farmers who have reason to believe that their herds are not producing satisfactorily should get in touch with the Department for advice.

Fields that are to be cut for hay or silage should now be closed up. The best time to cut grass for hay is as soon as the pollen grains commence to show from the inflorescense.

Sheep.

In districts affected by this season's low rainfall, many farmers still have good reserves of grass and cereal hays which they wish to use as supplementary fodder for their sheep. Much hay, especially grass hay and the straw of oaten hay, is very unpalatable through being too mature when harvested, left too long in the harvest field during hot or wet weather, or through bad stacking, and many farmers are disappointed because the sheep are not eating the hay readily and continue to lose condition.

Sheep eat such hay more readily, and do much better, when it is fed with protein-rich foods, such as good green lucerne or clover hays. Usually, if 3 oz. of lucerne-hay are fed per sheep per day, the sheep will eat sufficient of the other hay to maintain their condition. One bale of lucerne-hay per day will supply this requirement to a flock of 400 sheep. With good quality grass or oaten hay, the lucerne-hay should not be necessary. On the other hand, when cereal straw is being fed, it will be necessary to double the amount of lucerne-hay.

Veterinary Notes.

Advice is frequently being sought relating to the eradication of worms in pigs. For this purpose, oil of chenopodium has been found to be the most effective drug, but at present it is somewhat difficult to obtain supplies. As a substitute, tetrachlorethylene, in the capsule form, gives good results. These capsules, together with dosage rates, can be obtained from the local chemist. Full directions in regard to the control of worms in all animals may be obtained on application to the Superintendent of Live Stock.

Trouble and mortality amongst poultry are liable to occur owing to the feeding of insufficient green stuff. This can usually be overcome by the addition of 1 per cent of cod liver oil to the morning mash, but as reliable supplies of cod liver oil are almost unprocurable, poultry keepers are advised to obtain a continuous and sufficient supply of green stuff.

At present, grass tetany is prevalent amongst cattle in certain districts, and readers are referred to our article on this complaint elsewhere in this *Journal* (W. D. Shew, B.V.Sc., Senior Veterinary Officer).

Poultry.

A short article on the marketing of eggs appears elsewhere in this issue.

Pigs.

The practice of weighing pigs during their growing stages is strongly recommended. Even when pigs are not obviously sick, they are often found to be making slow growth and giving a poor response for the food they are consuming, but such losses of time and food can only be detected when pigs and food are weighed to check the pigs' performances.

Weighing should commence when the litter is weaned at eight weeks' old, at which age a total litter weight of not less than 250 lb. should be attained. From weaning till 100 lb. live weight, that is, light porker stage, pigs should make an average live weight gain of not less than ¾ lb. daily. The average daily gain should increase as the pigs grow, and a 200 lb. live weight baconer should be produced in 200 days or less from birth.

If weighing shows that pigs are not making satisfactory progress, the breeder should look for the cause in his breeding stock, feeding, management, or accommodation. He might also suspect some parasitic infestation, such as worms or skin parasities, or even a disease infection.

If in doubt as to the cause of slow growth or the efficiency of food consumption pig raisers are advised to write to the Superintendent of Live Stock (L. A. Downey, H.D.A., Pig Expert).

Bees.

October is normally a busy month in the apiary. Cape weed is in full bloom and swarming is at its height. Seasonal conditions have been far from normal, and, where doubt exists concerning the prospects of a good honey flow, discretion should be used before increasing the colonies. Where an increase is not desired, every effort should be made to keep

the bees contented by giving extra supers to avoid congestion in the hives. When giving extra supers, it is advisable to exchange one or two combs from supers already in use to induce the bees to spread their operations throughout the additional space.

If it is desired to raise queens, there is no better time than during the swarming season when vigorous young queens can be obtained with minimum effort. Under normal seasonal conditions, this period is also favourable for the building of new combs.

While examining the hives to control swarming, all brood cells should also be carefully examined for disease. Healthy brood is an even colour with slightly domed cappings. If dark sunken cells which have failed to hatch are noticed, disease may be present, and, if not controlled immediately, it may spread throughout the whole apiary. The Superintendent of Live Stock should be notified so that an inspection can be made and advice concerning control given (J. S. Eagland and J. W. Thomlinson, Apiary Inspectors).

Book Review

"Beef Cattle" (3rd Edition) by Roscoe R. Snapp, Ph.D., Associate Professor of Animal Husbandry, University of Illinois. (England: Chapman and Hall, Ltd., 550 pages, 24/- nett).

THIS third edition of "Beef Cattle" is a most comprehensive work dealing with all phases of the beef cattle industry and contains very valuable information for beef producers in all parts of the world. Many of the chapters are very applicable to Australian conditions and a study of the volume and the incorporation of some of the information into beef cattle production here are considered worth while.

The book is written in four parts. The first part is a review and history of the beef cattle industry throughout the world, and shows how, originally in districts and countries some distance from markets, cattle were run mainly for their hides, tallow, and sometimes "jerky" or salted and dried beef. This was followed by long trailing and then more speedy transport by ship, rail, and road motor to meat markets. These developments and the invention of the hermetically sealed tin can and refrigeration for frozen and chilled beef as affecting cattle production are shown for the leading beef producing countries.

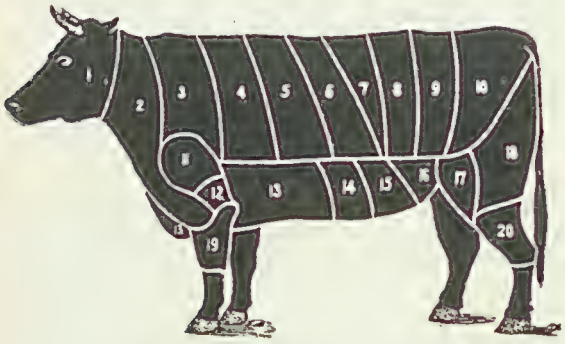
The second part of the book contains chapters dealing with the selection, breeding, rearing, and general management of beef cattle. The third part refers to fattening cattle for market. The western States of the United States of America are essentially grazing areas where the cattle are bred and reared for selling to corn (maize) growers in the central States. The grazing areas are usually so heavily stocked as to produce only a growing ration and as conserved fodder is required for fattening, it is regarded as more economical to sell stores than buy or grow feed. In the corn belt, greater returns are obtained by selling the corn as beef, while the manure maintains soil fertility. Over 60 per cent. of the corn and hay grown is fed on the farm where it is produced. Even where intensive feeding is carried out much land is in pasture. Contrary to popular belief the cattle are usually fed and fattened during the winter in the open. The value of many fodders and methods of feeding are described, but the usual rations consist of corn silage, corn, lucerne hay, and a protein meal.

The last part opens up with excellent chapters on baby beef production and marketing. In the United States of America the commission for buying and selling cattle is so much per head and not a percentage of the gross monetary returns. The commission, however, works out at approximately 1 per cent. of the gross returns.—A.C.T.H.

The Meat We Eat

By W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer

FROM time to time the Department has received requests from stockowners and others for information regarding the best means of cutting up beef, mutton, and pork for table use. In answer to these inquiries the following lists have been prepared, setting out in detail the various cuts made by experienced butchers, with a short description of the most common uses made of these parts by housewives.



Showing the various parts of the ox.
[W. Angliss.

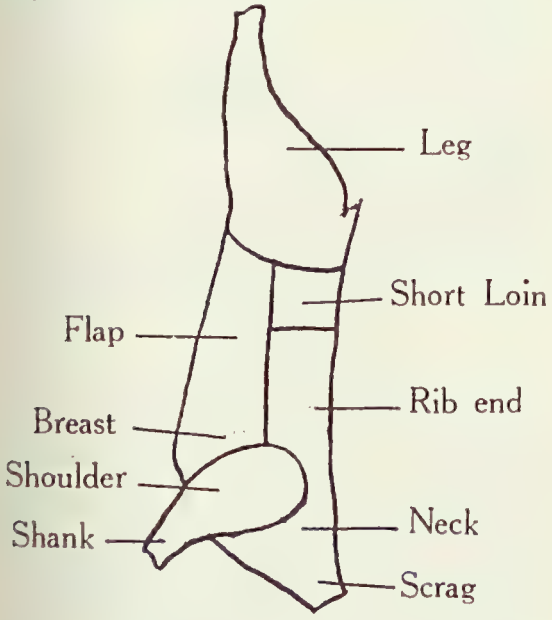
Beef Joints.

No. 1. Ox cheek—splendid entree, can be braised or stewed; requires to be well cooked.
No. 2. Neck—suitable only for beef tea, soups, or stews.
No. 3. Chuck—pot roast, free from fat.
No. 4. Back ribs—cheap roasting joint.
No. 5 and 6. Prime ribs—prime roasting joint, may be rolled or supplied with bone.
No. 7. Wing rib—prime roasting joint, free from surplus fat.
No. 8. Middle loin—prime roasting joint.
No. 9. First cut sirloin—prime roasting joint with undercut.
No. 10. Rump—prime steak meat; selvidge fat.
No. 11. Shoulder—tender beef steak for pan or puddings.
No. 12. Bolar—good boiling joint.
No. 13. Brisket—popular corned beef, usually supplied rolled.
No. 14. Brisket—middle cut, corned with bone; streaky fat.
No. 15. Brisket—thin end, corned with bone; streaky fat.
No. 16. Thin flank—corned and rolled; extra quantity of fat.
No. 17. Thick flank and topside—prime beef steak.
No. 18. Silverside—corned round, prime corned joint, free from fat.
No. 19. Shin—suitable for soups and potted meats.
No. 20. Leg—suitable for soups and potted meats.

In addition to the foregoing, there are in the beast several very appetising and useful parts, namely, tripe (the wall of the first and

Fat lambs at the freezing works ready for slaughter.

second stomachs), ox tail, kidney, tongue, and heart, which may be used variously in soups, pies, or stews.



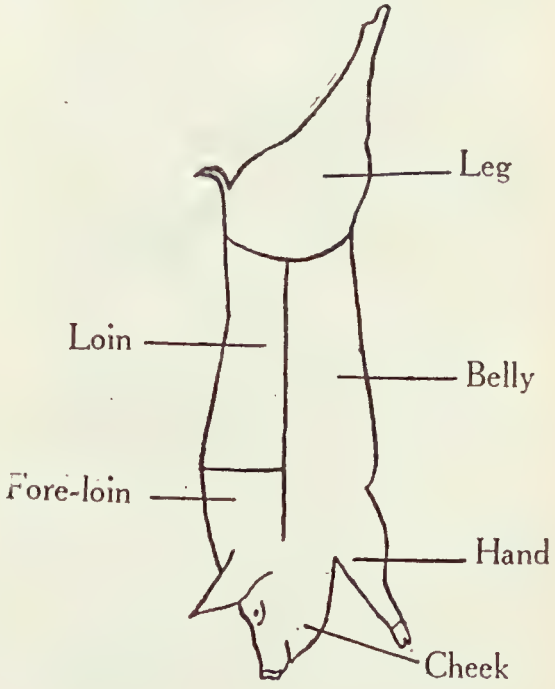
Showing the parts of the sheep.

Mutton.

Forequarter—used chiefly for roasting and boiling.
Forequarter chops—used chiefly for stewing.
Shank—used chiefly for broth.
Breast—used chiefly for pies and broth.
Best end of neck—used chiefly for roasting or boiling.
Scrag end of neck—used chiefly for stewing.
Hindquarter—
Leg—used chiefly for roasting or boiling.
Loin—used chiefly for roasting.
Rib end—used chiefly for cutlets, grilling, or frying.
Short loin—used chiefly for chops, grilling, or frying.
Flap—used chiefly for stewing.
Sheep's head—used chiefly for soups.
Trotters—used chiefly for stewing for invalids.

Pork.

Leg—used chiefly for roasting, or boiling, corned or fresh.
Loin—used chiefly for roasting joints, and chops for frying.
Belly—used chiefly for corning and boiling; streaked with fat and lean.
Hand—used chiefly for corning and boiling; lean joint.
Cheek—used for corning, boiling, or making potted meat.
Trotters—excellent for boiling.



Showing the parts of the pig.

Burnley Egg-Laying Competition, 1940-41

Results of Winter Test

By H. F. Clinton, Poultry Expert

THE thirtieth Burnley Egg-Laying Competition commenced on the 1st April, 1940, and will continue until 2nd March, 1941, a period of 48 weeks. The winter test conducted in connexion with the annual competition covers only the first four months (122 days), and concluded on 31st July. For this test, certificates are awarded for the greatest number of first-grade eggs laid by teams and individual birds in all classes of the competition. During the first two months, a first-grade egg must weigh not less than 1¾ oz., and thereafter not less than 2 oz.

The object of the winter test is to give prominence to the birds that lay well during this period of the year, when prices for eggs are high. It is considered that egg production on commercial poultry farms could be considerably improved by breeding from birds that have laid a large number of eggs during the autumn and winter months, and those that lay well at that period are almost certain to continue to do so at other times of the year.

It is again pleasing to note the popularity of Rhode Island Reds. The high standard set last year, when 96 Rhode Island Reds competed, has been maintained this year. This is the highest number of the breed that has ever competed in a Burnley competition, or any Government competition in Australia.

Some high scores were recorded, and several well-known competitors were again conspicuous amongst the prize winners.

Teams of Six.

In Section A, Class 1, White Leghorns, Wet Mash, Mr. C. Gowers (White Wings Poultry Farm), third prize winner in this class in the winter test last year, won first prize with a team that laid 463 eggs, all first grade. Second prize was awarded to Mr. F. W. Becker, for a team that laid 440 eggs, and Mr. K. McKenzie's team was third with 399 eggs. A bird in Mr. Becker's team laid 96 eggs, all first grade.

In Class 2, White Leghorns, Dry Mash, Mr. F. W. Becker, who won first prize in this class in the winter test last year, again secured first prize with a team that laid 524 first-grade eggs. A bird in this team laid 100 eggs, all first grade. Mr. C. R. Fagg, took second and third prizes, with teams that laid 330 and 329 eggs, respectively.

In Class 4, Australorps, Mr. J. J. Herbert, whose team of Australorps in the previous competition laid the highest number of eggs in this class in the winter test, and also established a new Burnley record for twelve months, again won first prize with a team that laid 534 first-grade eggs, again the highest score in all classes of Section A. One bird in this team laid 110 eggs, all first grade, the highest number of eggs laid by any individual bird in the competition. Mr. W. Weston was awarded second prize with a team that laid 435 eggs, and Messrs. D. and J. Tresise were third with 418 eggs.

In Class 5, Rhode Island Reds, Messrs. Tedstone and Rankin repeated last year's performance, and secured first prize with a team that laid 429 first-grade eggs. Mr. A. J. Glanfield gained second prize with a team that laid 400 eggs, while Mr. J. Chatts was third with 376 eggs. One bird in a team in this class, owned by Mr. A. E. Hill, laid 95 eggs, all first grade.

Individual Birds.

In the Class for White Leghorns fed on Wet Mash, Mr. T. Birchall, equal third prize winner in this class in the winter test last year, won first prize with a bird that laid 93 first-grade eggs. Mr. A. R. Davey gained second prize with a bird that laid 91 eggs, while Mr. H. Clear and Mr. T. J. Stevens were equal for third prize; each of their birds laid 90 eggs.

In the White Leghorn Class, fed on Dry Mash, Mr. J. M. Sutherland, and Mr. T. A. Pettigrove (third prize winner in this class in the winter test last year), were equal for first prize, each of their birds having laid 88 first-grade eggs. Mr. C. R. Fagg secured third prize with a bird that laid 87 first-grade eggs.

First prize in Class 3, i.e., All Light Breeds other than White Leghorns, was awarded to Mr. J. Granter, whose Brown Leghorn laid 67 first-grade eggs. This breeder was successful in this class in the winter test last year. Mr. D. Granter gained second prize with a Brown Leghorn that laid 61 eggs.

In the Class for Australorps, Mr. F. W. Becker won first prize with a bird that laid 106 first-grade eggs, the highest number laid in all Classes of Section B. Mr. J. J. Herbert secured second prize with a bird that laid 103 eggs, while Mr. F. W. Rogers, and Mr. J. J. Herbert, were equal for third prize; each of their birds laid 99 eggs.

Messrs. A. and G. Turnbull obtained first prize in the Class for Rhode Island Reds, with a bird that laid 105 eggs, all first grade. Second prize was awarded to Mr. J. Chatts with a bird that laid 97 eggs, and Mr. A. Johnson was third with 93 eggs.

In the Class for All Heavy Breeds, other than Australorps and Rhode Island Reds, Mr. D. Granter, second prize winner in this class last year, won first prize with a White Wyandotte, that laid 71 eggs, all first grade. Mrs. D. Mason, third prize winner in this class in the winter test last year, gained second prize with a Light Sussex that laid 62 eggs.

SECTION A.—TEAMS OF SIX BIRDS—TRAP-NESTED.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
1	White Wings Poultry Farm (C. Gowers), 99 Church-road, Carrum	463	..	463
	Second Prize—Government Certificate.			
6	F. W. Becker, Follett-road, Cheltenham, S.22	440	..	440
	Third Prize—Government Certificate.			
3	K. McKenzie, Whittington P.O., St. Albans, via Geelong	401	2	399
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate.			
30	F. W. Becker, Follett-road, Cheltenham, S.22	526	2	524
	Second Prize—Government Certificate.			
31	C. R. Fagg, 76 Maud-street, Geelong	354	24	330
	Third Prize—Government Certificate.			
32	C. R. Fagg, 76 Maud-street, Geelong	336	7	329

Section A.—*continued.*

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate.			
55	J. J. Herbert, 13 Dunn-street, Wonthaggi	537	3	534
	Second Prize—Government Certificate.			
59	W. Weston, 104 Broome-street, Wonthaggi	474	39	435
	Third Prize—Government Certificate.			
65	D. and J. Tresise, Serpentine	430	12	418
	Class 5.—Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
49	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	430	1	429
	Second Prize—Government Certificate.			
41	A. J. Glanfield, 132 Separation-street, Northcote, N.16	427	27	400
	Third Prize—Government Certificate.			
40	J. Chatts, White-street, Beaumaris, S.10	376	..	376

SECTION B.—INDIVIDUAL BIRDS, SINGLE TEST.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
8	T. Birchall, 180 Harold-street, Thornbury, N.17	94	1	93
	Second Prize—Government Certificate.			
86	A. R. Davey, Elward-street, Greensborough	92	1	91
	Equal Third Prize—Government Certificate.			
11	H. Clear, 3 Haig-street, Heidelberg West, N.23	90	..	90
	Equal Third Prize—Government Certificate.			
81	T. J. Stevens, 309 Darling-street, Ballarat	92	2	90
	Class 2.—White Leghorns—Dry Mash.			
	Equal First Prize—Champion Certificate.			
207	J. M. Sutherland, Fulton-road, Box Hill	88	..	88
	Equal First Prize—Champion Certificate.			
218	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	89	1	88
	Third Prize—Government Certificate.			
211	C. R. Fagg, 76 Maud-street, Geelong	93	6	87

Section B.—*continued.*

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 3.—All Light Breeds other than White Leghorns—Wet Mash.				
	First Prize—Champion Certificate.			
190	J. Granter, 163 Martin-street, Gardenvale, S.4 (Brown Leghorn)	69	2	67
	Second Prize—Government Certificate.			
192	D. Granter, 163 Martin-street, Gardenvale, S.4 (Brown Leghorn)	61	..	61
Class 4.—Australorps—Wet Mash.				
	First Prize—Champion Certificate.			
102	F. W. Becker, Follett-road, Cheltenham, S.22	110	4	106
	Second Prize—Government Certificate.			
115	J. J. Herbert, 13 Dunn-street, Wonthaggi	103	..	103
	Equal Third Prize, Government Certificate.			
95	W. F. Rogers, 28 Innellan-road, Murrumbeena, SE.9	99	..	99
	Equal Third Prize, Government Certificate.			
116	J. J. Herbert, 13 Dunn-street, Wonthaggi	99	..	99
Class 5.—Rhode Island Reds—Wet Mash.				
	First Prize—Champion Certificate.			
172	A. and G. Turnbull, 103 Locksley-road, Ivanhoe, N.21	105	..	105
	Second Prize—Government Certificate.			
179	J. Chatts, White-street, Beaumaris, S.10	97	..	97
	Third Prize—Government Certificate.			
166	A. Johnson, Sunray-avenue, Cheltenham, S.22	93	..	93
Class 5.—All Heavy Breeds other than Australorps and Rhode Island Reds—Wet Mash.				
	First Prize—Champion Certificate.			
156	D. Granter, 163 Martin-street, Gardenvale, S.4 (White Wyandotte)	71	..	71
	Second Prize, Government Certificate.			
152	Mrs. D. Mason, Mount Evelyn-road, Lilydale (Light Sussex)	86	24	62

FOR INDIVIDUAL BIRDS IN EACH CLASS OF SECTION A.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.					
	First Prize—Champion Certificate.				
6	F. W. Becker, Follett-road, Cheltenham, S.22	32	96	..	96
	Equal Second Prize—Government Certificate.				
22	Sorrento Farm, Campbell-road, Sorrento	127	92	..	92
	Equal Second Prize—Government Certificate.				
7	B. G. Evans, Block 21A, Red Cliffs	40	92	..	92
Class 2.—White Leghorns—Dry Mash.					
	First Prize—Champion Certificate.				
30	F. W. Becker, Follett-road, Cheltenham, S.22	180	100	..	100
	Equal Second Prize—Government Certificate.				
30	F. W. Becker, Follett-road, Cheltenham, S.22	175	97	..	97
30	" " "	177	97	..	97
Class 4.—Australorps—Wet Mash.					
	First Prize—Champion Certificate.				
55	J. J. Herbert, 13 Dunn-street, Wonthaggi	329	110	..	110
	Second Prize, Government Certificate.				
55	J. J. Herbert, 13 Dunn-street, Wonthaggi	327	109	1	108
	Equal Third Prize—Government Certificate.				
55	J. J. Herbert, 13 Dunn-street, Wonthaggi	530	98	..	98
	Equal Third Prize—Government Certificate.				
50	C. H. Harvey, Pakenham South	300	98	..	98
Class 5.—Rhode Island Reds—Wet Mash.					
	First Prize—Champion Certificate.				
44	A. E. Hill, 26 Brenbeal-street, Balwyn, E.8	264	95	..	95
	Second Prize—Government Certificate.				
49	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	292	93	..	93
	Third Prize—Government Certificate.				
44	A. E. Hill, 26 Brenbeal-street, Balwyn, E.8	262	91	..	91

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—November, 1940

Grade Herd Test

Annual Report 1939-40

By W. J. Yuill, Supervisor of Herd Testing

THE yield of 72,203 tons of butter and 10,803 tons of cheese, for the year 1939-40 constitutes a record for this State, being approximately double that of ten years ago. This, however, is due largely to an increase of up to 50 per cent. in the number of cows now in our dairy herds as compared with 1929-30. But allowance may be made for this factor and still there is an increase of 5,333 tons of butter, over the previous high yield of 1936-37 to be accounted for. The question arises, what factor or factors could have caused such a remarkable increase in cow-yields in so many areas of the State?

If reference is made to the graph which accompanied the 1938 Annual Report of Association Testing, it will be seen that there was a steady annual increase in production, during the decade that followed the inauguration of herd-testing. When the movement began in 1921-22, the average yield of the 1,600 tested cows was below 170 lb. butter-fat. By 1932, the average yield had increased to 247 lb. per cow, despite the fact that the number of cows under test had risen to 89,000. During this period, the herds had been extensively culled of low yielding cows, and the fertilizing of pastures had increased greatly, while thousands of acres of better pastures were sown down. The value of supplementary fodders in this period had become better appreciated, and this led to the increased use of legume hays, such as lucerne and red clover, in place of cereal hay and green maize. Conservation of fodder received greater attention than previously, grass silage and meadow hay being favoured because of their greater milk producing qualities.

In the general scheme of improved dairy-farming, which resulted from the thousands of attendances at educational field days, held at various times throughout the State on hundreds of successfully operated dairy farms, special attention was given to the subject of the breeding of better dairy herds. One phase of this programme, was the introduction of large numbers of pure bred herd-sires. So greatly did this feature develop, that over 80 per cent. of herd sires in use in Association tested herds have, for some years past, been of this class.

Messrs. Wilkinson and McDonald's "Darkie," champion grade cow for 1939-40 with 763 lb. butter-fat.

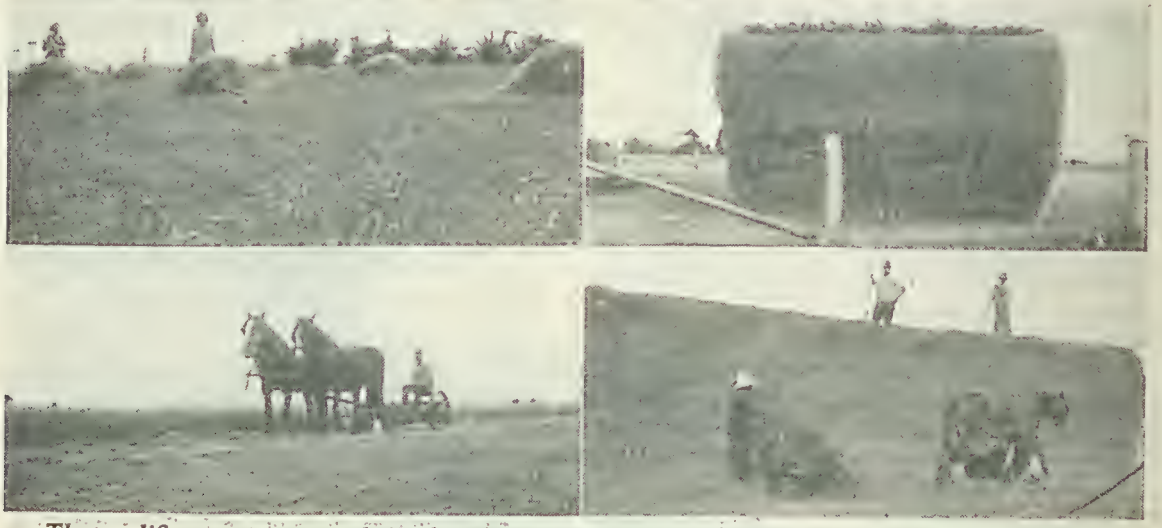
There can be little doubt that the steady increase in the average yield of all cows, was largely attributable to the information gained from studying the successful methods of leading farmers, demonstrated at these field days. The top-dressing of pastures, the culling of herds, and the better feeding of the the cows, together with the effect of breeding, and the more efficient methods of farm management must be considered as being the primary causes of improvement.

Improvement in yields continued until 1932, but no further advance was made from that date until last year, although good seasons were experienced.

It is an established fact that feeding test-cows generously, during their pre-calving rest-period, with a protein-rich ration is conducive to high milk yields. Indeed, this aspect of preparing record-breaking cows is largely exploited by breeders who desire to develop the maximum producing ability of their herds and cows.

According to Dr. John Hammond, the English authority, this practice of "steaming up" cows of high yield, is now developing among the commercial dairy-farmers. The system is generally applied to "first-calvers," which receive in their feed from 10 to 12 lb. of rich concentrates daily for several weeks prior to calving. It has been found, that the stimulus given to the milk-secreting cells in the udder is such, that these heifers, when milked thrice daily and fed according to yields, will develop up to 90 per cent. of their mature dairy ability. If, under these circumstances, they do not perform satisfactorily, they are fattened off for the butcher, at the conclusion of their first lactation. This effect of rich feeding on udder development during the pre-calving rest period, is at times noticed by observant dairy farmers. It is most frequently associated with cows and heifers that calve in late spring or early summer and is particularly noticeable when these cows have grazed abundant rich clover pasture for some time prior to calving. Such conditions rarely apply to the great mass of late autumn, winter and early spring calving cows. This is so mainly because the pastures have not then received their "growth impetus," which usually occurs about mid-spring. Quite generally the ill effects of winter, scant pastures and inferior rations, result in the opposite effect to that obtained from rich feeding during the pre-calving rest. Indeed, it is the common practice to reserve for the cows in milk any forward pastures, rather than feed such to dry cows or springing heifers. By feeding a protein-rich ration at the bails, the "steaming up" effect can be obtained with any cows in any year. When this has been done, they are prepared to go on and make satisfactory yields, always provided that suitable rations are fed throughout the lactation.

During the period under review, the great mass of autumn, winter and early spring calving cows enjoyed almost ideal conditions for high milk yields. The only disturbing factor was the subsequent dry summer, which affected the yields of the late spring calving cows.



The prolific pasture growth in the 1939-40 season is indicated in the above illustrations.

Mr. Henry Jackson's leading herd (38 cows), which averaged 459 lb. butter-fat for 1939-40.

Owing to the drought conditions of 1938, large numbers of cows were dried off earlier than usual, and enjoyed a very long rest. Even those cows that milked on under the stimulus of abundance of rich "springlike" growth, eventually dried off in more or less fat condition.

Generally the cows calved in wonderful condition. Many had rested longer than usual, while almost all of them had grazed rich, abundant pastures both before and after they had calved. So luxurious was the autumn growth, that silage was made in the late autumn from meadows that were drought-stricken and bare before the rains came in late February and early March.

During the following spring, unusually high herd-yields were recorded in many districts. In some instances herds averaged around 2 lb. butter-fat per day for many weeks, while some very large herds exceeded 1½ lb. a day for a considerable period. At their top, some individuals exceeded 3 lb. butter fat a day, and more cows exceeded 2½ lb. a day than had ever been known previously.

There can be no doubt that the greatest factor in the remarkably high yields registered last season, was that of the unusually rich feeding, obtained in abundance during the pre-calving rest and during the first half of the lactation period. The feeding was available earlier than in previous good seasons and over a much longer period.

The cumulative effect of herd culling, better breeding, better pastures, management and fertilising programmes, had previously brought the Association average up to about 244 lb. buter-fat, but the better feeding during the period referred to appears to be equal to a further increase of 14 lb. butter-fat per cow.

High Butter-fat Yields.

In this report dealing with the performances of 17,217 cows, there are 23,224 records of more than 300 lb. butter-fat, or approximately 30 per cent. of all cows that completed their test in the year under review.

Of the 3,357 cows which produced more than 400 lb., no fewer than 275 exceeded the high level of 500 lb. butter-fat. On this occasion—for the first time—every cow in the "best

A group of two-year old heifers from Mr. J. McKinnon's herd of 81 cows which averaged 313 lb. butter-fat.

Three of Mr. E. C. Wines's herd of 23 cows, which averaged 421 lb. of butter-fat.

twenty list" produced over 600 lb. butter-fat. Another fine record is that all the twelve leading three-year-olds exceeded the 500 lb. mark, while several of the two-year-old group also exceeded this high yield.

The leading cow of the year is owned by Messrs. Wilkinson and McDonald of Kerang. Her ancestry is unkown, but herd testing has revealed her amazing ability. In the previous year she produced 596 lb. butter-fat. This fine yield was followed by her record effort of 16,183 lb. milk and 763 lb. butter-fat. Her owners state that she has received no special care or food, being a member of a herd of 75 cows which are milked under ordinary farm conditions. "Darkie" is about nine years of age, and has begun her current test year with a daily yield of 77½ lb. milk, 4.6 test, and 3.4 lb. butter-fat. Another fine producer in this herd is "Lovely," a 467 lb. junior two-year-old.

The second highest producer of the year comes from the South Gippsland district. Her owners, Messrs. Finlay Bros., are members of the Toora-Welshpool Association. The 703 lb. record of their grade cow "Nancy" is not a freak performance, for she was one of the "best twenty" in the previous year, with a yield of 623 lb. butter-fat. Such continuous high yielding capacity stamps her as a really great dairy cow.

Mr. C. Runciman of Swan Hill, is known as one of the staunchest supporters of the association system of herd testing. He is also the owner of a very fine herd of grade and pure-bred Jerseys. His home-bred registered cow "Bideford Sapphire 2nd," obtained third place with a yield of 695 lb. butter-fat; while "Melba," with 616 lb. is one of his six grades that exceeded the 500 lb. level.

The next three cows are all from Gippsland, and are owned by Messrs. Clyne Bros. of Maffra, Mr. O. S. Martin of Traralgon, and J. G. Howell of Leongatha. The name of

SUMMARY OF HERD TEST ASSOCIATION DATA FOR THE YEAR ENDED 30TH JUNE, 1940.

Area.	Units.	Herds.	Cows.	Junior Cows under Test.		Pure Bred Bulls.		Average Number Cows in Herds.	Average Production per Cow.		
				Heifers.	Per cent.	Bulls.	Per cent.		Milk.	Test.	Butter-fat.
									lb.		lb.
Gippsland ..	43	994	33,550	13,969	41·6	784	78·9	34	5,305	4·89	259
Western ..	28	627	22,612	8,546	37·8	535	85·3	36	5,496	4·65	256
North-Eastern ..	13	280	11,332	4,367	38·5	243	86·8	40	5,170	4·95	256
Goulburn Valley ..	12	304	10,324	4,938	47·8	284	91·1	33	6,164	4·62	285
Totals ..	96	2,176	77,217*	31,820	41·2	1,846	85·0	36	5,450	4·79	261
DATA OF PREVIOUS YEARS.											
1938–39 ..	100	2,275	79,805	34,248	42·9	1,904	83·6	35·0	4,749	4·7	221·0
1937–38 ..	104	2,401	86,048	37,467	43·5	1,969	83·0	36·0	4,876	4·7	227·0
1936–37 ..	107	2,350	80,528	36,106	45·0	1,874	81·0	34·3	5,076	4·80	244·0
1935–36 ..	108	2,416	80,817	37,817	47·0	1,946	81·0	33·0	4,934	4·7	233·0
1934–35 ..	113	2,446	79,701	36,116	45·3	1,991	81·4	32·6	5,309	4·59	244·0
1933–34 ..	134	2,910	92,953	43,394	46·0	2,214	76·0	31·7	4,723	4·51	212·0
1932–33 ..	141	3,383	104,009	46,392	44·6	2,619	77·0	31·0	5,290	4·55	241·1
1931–32 ..	130	3,098	89,619	36,946	41·3	2,323	75·6	29·0	5,393	4·58	247·3
1930–31 ..	132	3,085	90,360	32,867	36·4	2,251	73·0	29·0	5,383	4·30	234·0
1929–30 ..	116	2,604	76,032	24,439	32·1	1,653	71·0	29·0	4,944	4·59	226·1
1928–29 ..	96	2,229	63,277	19,246	30·4	1,354	64·0	30·0	5,080	4·38	223·3

* Owing to the dislocation caused by war-time conditions, Annual Reports are not to hand from Orbost, Sale, Pyramid Hill–Calivil, Yarra Valley and Noorat Associations. Cows tested by these Associations would bring the number of cows tested by all Associations to 84,690.

High Producing Herds of Less than 20 Cows.

(In Order of Merit.)

Owner.	Association.	Number of Cows.	Butter-fat.
			lb.
J. A. Archibald ..	Rochester No. 1 ..	11	455
T. A. Burgman ..	North Shepparton ..	16	427
H. H. Wallace ..	Swanpool	13	422
D. Fehring ..	Rochester No. 2 ..	15	406
H. F. McRae ..	Rochester No. 1 ..	14	404
T. B. Edwards ..	Bacchus Marsh ..	12	403
J. A. Ellett ..	Pakenham	13	402
E. Harris ..	Tallangatta ..	16	397
A. J. Morton ..	Kerang	18	396
C. McColl ..	Bunyip	19	394
W. R. Orr ..	Stanhope	15	390
W. Collier ..	Loch	19	386
J. R. Hay ..	Leongatha ..	19	380
E. Matheson ..	Myrtleford–Whorouly	10	375
R. Dodd ..	Alexandra	17	375
K. Daffy ..	Nalangil	17	369
R. Savage ..	Pakenham ..	15	366
A. W. Johnson ..	Myrtleford–Whorouly	13	366
G. R. Rankin ..	Rochester No. 1 ..	17	363
G. R. Bright ..	Dumbalk	15	363
F. F. Rau ..	Winchelsea ..	12	360
G. Haines ..	Rochester No. 1 ..	10	359
E. A. Vistarini ..	Kerang	17	355
J. R. Canobie ..	Jindivick–Nerrim ..	10	355
W. Semple ..	Rochester No. 1 ..	11	354
J. Dickson ..	Undera	16	353
J. J. Wilson ..	Welshpool	19	353
Mrs. E. Munro ..	Casterton	11	351

Mr. Howell is well known among herd-testing farmers. No fewer than eleven of his cows exceeded 500 lb. butter-fat in one year. On this occasion his cow "Trixie" produced 677 lb. This great effort followed on three others of more than 500 lb. She seemed to be heading for another high yield, for she made 193 lb. butter-fat during the first 96 days of this season, when she succumbed to an attack of bloat. Only 7 lb. butter-fat separate the next three cows on the list. The first two—Mr. J. M. Newton's "Chrissie," a grade Australian Illawarra Shorthorn; and Mr. L. J. Hanley's "Violet"—both come from nearby areas of North-east Victoria. Their yields of butter-fat are similar, but their yields of milk and butter-fat percentage show a remarkable variation. "Dawn 9th," a registered Jersey, with 654 lb. butter-fat, is owned by Mr. T. Gaw, and represents a herd that is usually prominent in Association Herd Tests Reports.

"Auburn" (648 lb. butter-fat) is the property of a member of the Glengarry West Young Farmer's Club. She is tested in the herd of Mr. E. J. Brady of the Traralgon Association. This fine record is no "fluke yield," for it was preceded by one of 536 lb. in the previous year as a three-year-old.

"Joice" owned by Mr. J. McKinnon; 560 lb. butter-fat.

High Producing Herds of 20 to 39 Cows.

(In Order of Merit.)

Owner.	Association.	Number of Cows.	Butter-fat.
			lb.
H. Jackson ..	Rochester No. 2 ..	38	459
R. Cox	Swan Hill No. 1 ..	22	430
L. J. Hanley ..	Tallangatta No. 2 ..	28	423
C. E. Wines ..	Woodford	23	421
J. A. Newton ..	Myrtleford–Whorouly	35	416
A. C. Bentley ..	Jindivick–Nerrim ..	21	410
A. G. Crombie ..	Dumbalk	26	407
H. R. Heath ..	Leitchville	36	399
R. Lukin ..	Tallangatta No. 2 ..	20	398
P. A. Freestone ..	North Murchison ..	25	397
A. H. Burgman and Sons	North Shepparton ..	23	397
J. D. Pierce ..	Rochester No. 1 ..	24	389
L. Pay	Kerang No. 1 ..	29	389
W. Wade ..	Maffra No. 1 ..	35	388
Evison and Batcma	Warragul No. 1 ..	33	387
G. S. Dunstone ..	Korumburra No. 1 ..	24	383
A. J. Saunders ..	Leongatha No. 3 ..	35	383
O. Jones ..	Dumbalk North ..	27	382
W. Matthew ..	Korumburra No. 3 ..	28	380
F. Butler ..	Swan Hill No. 1 ..	22	379
L. Prigg ..	Rochester No. 2 ..	36	377
P. Hickey No. 2 ..	Cobden	30	377
R. Jackson ..	Leongatha No. 2 ..	30	377
H. E. Keele and Son	Rochester No. 1 ..	34	376
L. Knox ..	Loch No. 1 ..	23	376
W. Harris ..	Dumbalk North ..	32	375
W. Hollyoak ..	Leongatha ..	26	375
R. Rautman ..	Maffra No. 2 ..	20	375
M. O. Bunn ..	Korumburra No. 1 ..	24	374
Mrs. F. Clayton ..	Tongala	32	373
H. Molyneaux ..	Warragul No. 3 ..	20	372
A. E. Blundy ..	Winchelsea No. 1 ..	26	369

High Producing Herds of 40 to 59 Cows. (In Order of Merit.)

Owner.	Association.	Number of Cows.	Butter-fat.
			lb.
T. Lee ..	Cohuna	40	402
S. Esler ..	Undera	41	401
J. A. Jewel ..	Tallangatta No. 2 ..	40	389
M. Goldsmith ..	Dumbalk North ..	45	387
L. H. Semmens ..	Maffra No. 1 ..	43	385
T. Gaw ..	Wonthaggi No. 2 ..	44	383
J. G. Howell ..	Leongatha No. 1 ..	49	381
L. A. Pearce ..	Leitchville ..	57	377
R. G. Anderson ..	Rochester No. 1 ..	45	377
C. Maud ..	Cohuna	50	371
C. F. Runciman	Swan Hill	44	368
S. A. Turner No. 1	Kiewa Valley No. 1 ..	41	368
Rawlinson Bros. ..	Werribee South ..	42	364
W. Hornsby ..	Cohuna	40	359
H. Furphy ..	Dumbalk North ..	47	354
Hamilton Bros. ..	Dumbalk North ..	43	353
H. J. Batten and Sons	Warrnambool ..	57	352
S. Critten ..	Dumbalk North ..	44	352
K. and H. Thompson	Cohuna	46	351
J. D. Campbell ..	Kerang No. 1 ..	45	350

High Producing Herds of 60 to 79 Cows. (In Order of Merit.)

Owner.	Association.	Number of Cows.	Butter-fat.
			lb.
E. J. Bingham ..	Warragul	78	366
Harrison Bros. ..	Dumbalk North ..	77	365
A. Sim	Ondit–Irrewarra ..	68	348
J. Little ..	Maffra No. 1 ..	62	348
Gannon Bros. ..	Winchelsea No. 1 ..	66	342
W. A. Cardwell ..	Eskdale	65	342
R. McG. Jamison	Kiewa No. 1 ..	69	334
K. Stockel ..	Maffra No. 1 ..	61	331
H. G. Noble ..	Maffra No. 1 ..	68	329
R. F. McGarvie ..	Pomborneit ..	67	329
J. and V. Wallace No. 1	Portland	72	324
R. D. Nichol ..	Kiewa No. 3 ..	63	324
T. Steward ..	Loch	62	320
S. S. Moulton No. 1	Maffra No. 2 ..	62	319
Crosthwaite Bros.	Kiewa No. 3 ..	70	315
J. R. Harrison ..	Warragul	64	312
J. Wills ..	Bacchus Marsh ..	71	308
E. L. North ..	Leitchville	71	304
M. Whittaker ..	Maffra No. 1 ..	69	304
D. McDonald ..	Kerang No. 1 ..	68	304
Green and Black	Kiewa No. 2 ..	61	304
F. L. Scott ..	Kongwak	60	303
P. Hickey No. 1	Cobden	60	301

"Dora" is owned by Mr. T. G. Hines of Bacchus Marsh. There appears to be some doubt about her ancestry, but there can be no doubt of her dairy ability, for her record of 621 lb. butter-fat speaks for itself. Another cow from Bacchus Marsh, "Lerderderg Spring Violet" (616 lb. butter-fat), is a daughter of "Springfield No. 9," the all-time high producer of the Government Standard Test, her record being 860 lb. butter-fat. "Spring Violet" is therefore a maternal half-sister to "Darenth Black Rose" (764 lb.), the highest yielding cow of the Standard Test in 1936. An interesting point is that "Darenth Black Rose" and her sire, came from "Springfield No. 9."

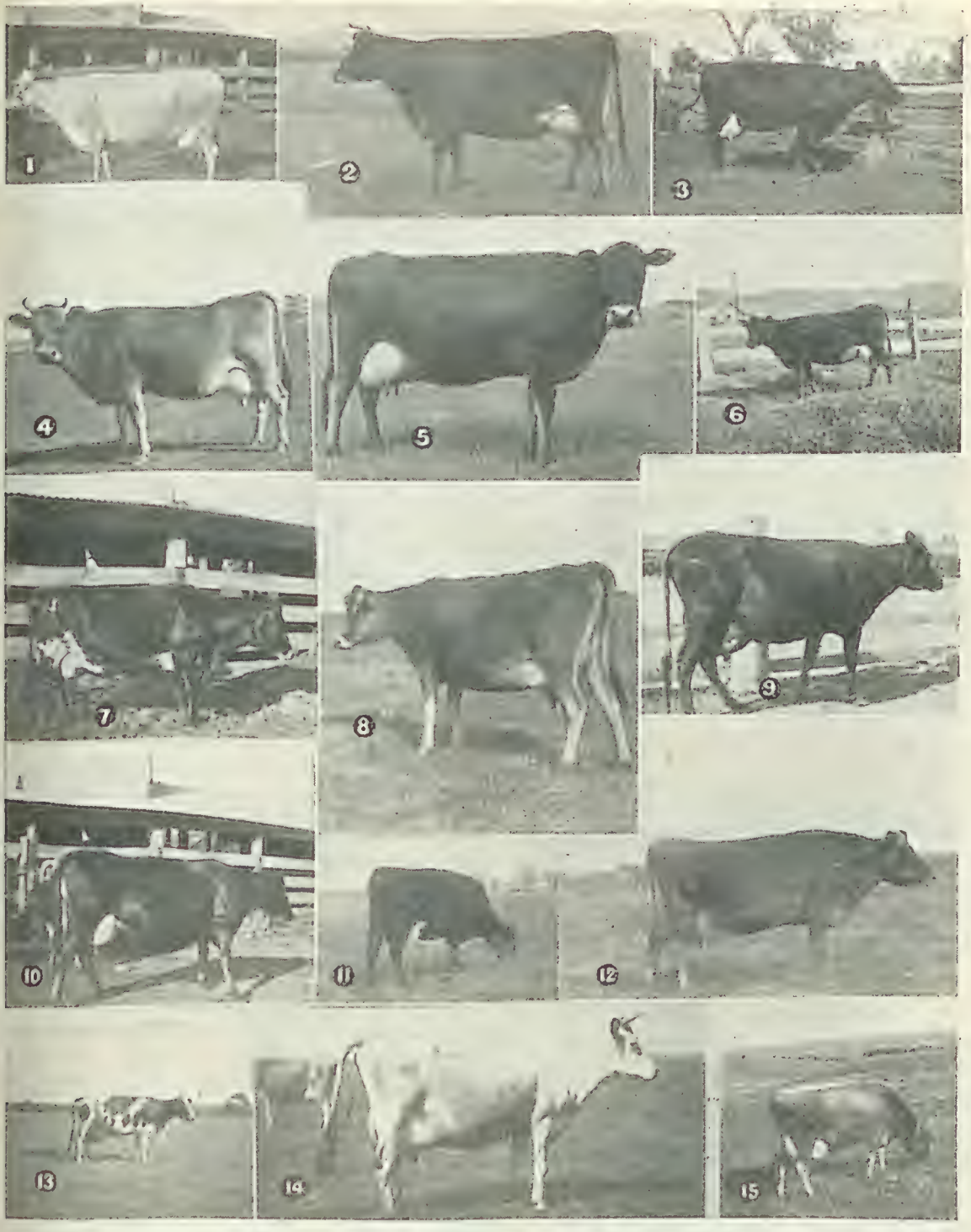
High Producing Herds Over 80 Cows. (In Order of Merit.)

Owner.	Association.	Number of Cows.	Butter-fat.
			lb.
H. J. Clark ..	Kiewa No. 1 ..	80	327
J. McKinnon ..	Ecklin No. 1 ..	81	313
A. Crosthwaite ..	Kiewa No. 3 ..	91	308
F. C. Williams No. 1	Narracan No. 1 ..	90	308
P. W. Linehan ..	Bunyip	80	307
N. McKinnon ..	Warrnambool ..	93	303
T. and G. Major	Cohuna	87	303
A. J. Boyd ..	Pomborneit ..	81	302
Macknamara Bros.	Werribee South ..	132	300
R. T. Mitchell (A)	Paschendale ..	84	294
J. Coolohan ..	The Sisters ..	90	287
W. J. Wheeldon	Warragul	133	281
E. Wright ..	Woodford	91	278
Exors. G. S. Clyne Estate	Maffra No. 1 ..	86	278
R. E. Knox ..	Kiewa	112	276
M. Singleton ..	Maffra No. 1 ..	80	276
H. W. Lester ..	Swanpool	82	275
A. D. Ford ..	Kiewa No. 3 ..	81	275
Clyne Bros. No. 1	Maffra No. 4 ..	99	269
W. Bailey ..	Werribee South ..	88	268
John Errey ..	Camperdown ..	88	266

Mr. J. Willis's cow is a consistent producer, having yielded 53,787 lb. milk and 2,184 lb. butter-fat during the past four years.

"Gem" (620 lb. butter-fat) is a grade Jersey owned by Mr. S. Esler of the Undera Association. In 1937, two of the top producers of the State came from this herd, which on this occasion, has the splendid average of 401 lb. butter-fat for 41 cows.

The remaining cows on the list have all earned the right to be classed as really great dairy cows, for the yield of 600 lb. butter-fat is the best evidence of unusual dairy ability.



1. Mr. L. J. Hanley's "Violet," 658 lb. butter-fat; 2. Mr. T. Gaw's "Dawn 9th," 654 lb. butter-fat; 3. Mr. W. Clement's "Lady," 604 lb. butter-fat; 4. Mr. E. J. Brady Jr's. "Auburn," 648 lb. butter-fat; 5. Mr. J. G. Howell's "Trixie," 677 lb. butter-fat; 6. Mr. P. Merkel's "Heather" 619 lb. butter-fat; 7. Mr. L. J. Hanley's "Magpie," 557 lb. butter-fat; 8. Mr. C. M. Runciman's "Sapphire 2nd," 695 lb. butter-fat; 9. Mr. L. Pay's "Rose," 615 lb. butter-fat; 10. Mr. L. J. Hanley's "Nell," 498 lb. butter fat; 11. Mr. W. Clement's "Lady," 604 lb. butter-fat; 12. Mr. C. M. Runciman's "Melba," 616 lb. butter-fat; 13. Mr. J. Will's "Lederderg Spring Violet," 616 lb. butter-fat; 14. Mr. J. A. McKinnon's 3-year-old "Pixie," 438 lb. butter-fat; 15. J. D. Myers's 2-year-old "Sylvia," 546 lb. butter-fat.

Leading Three-year-olds.

Never in the history of herd-testing has there been such a large number of high junior records. On this occasion, there are 5,927 records of more than 300 lb. butter-fat. Of the 3,241 three-year-olds which exceeded this level, 439 exceeded 400 lb.—sixteen being over 500 lb. These are listed together with some details of their ownership and yields. The honour of heading this list is shared by a grade Friesian and a grade Jersey. Mr. J. A. Newton's "Robin" fills first position, because of the extra value, 465 gallons of milk. Mr. E. C. Wines' "Brindle," which also produced 555 lb. butter-fat, is a remarkly precocious young cow, for this record was preceded with a junior two-year-old yield of 394 lb. At the close of her past record, it was necessary to dry her off owing to being close to calving.

In third place, is "Merrilyn Queen," with a yield of 536 lb. She is a registered Jersey owned by Mr. L. Semmens of Maffra, whose herd of 43 cows averaged 385 lb. butter-fat.

There are some remarkably high milk yields among this group. Mr. T. Lee's Friesian grade "Alice," with 16,050 lb. easily eclipses all others. Mr. J. A. Newton's grade Friesian "Robin," and Mr. J. Sinclair's Shorthorn-Friesian grade "Sally," each having milk yields of more than 13,000 lb., while "Sylvie," owned by R. Cox of Swan Hill, "Susan" (Fuller Bros., Dumbalk), and "Little Star" (E. W. Croucher, Myrtleford–Whorouly), are Jersey grades with yields exceeding 10,000 lb. Several others have milk yields of more than 9,000 lb. in addition to their over 500 lb. butter-fat yields.

There were many great performances among the remaining 423 three-year-olds not listed, which exceeded 400 lb. butter-fat, many of which would have been included in this list in a normal year. The yields indicate high dairy ability and good farm management, which have been expressed in full measure, because of an unusual year of good feeding.

Leading Two-year-olds.

Of the 2,696 two-year-olds that produced over 300 lb. butter-fat, there were 197 that exceeded 400 lb. The leaders of this group form the list given on page 547. The top six are all in the 500 lb. class. These include two from the very select herd of Mr. H. H. Wallace, a member of the Swanpool Association. The cows in this latter herd are fed a balanced test ration, and have been bred mainly off sons of high producing cows fron the noted Springhurst Jersey Stud. The last bull to be used in this herd, is a son of "Seaborne Successor," who holds the highest production index of any bull of any breed in this State.

The "class leader" is "Sylvia," with a yield of 546 lb. butter-fat. She is owned by J. D. Myers of Bacchus Marsh. Some idea of her ability may be gauged from the fact that she is a member of a herd of 40 cows which averaged 252 lb. butter-fat.

"Koala," with 523 lb. butter-fat, comes from Mr. H. Jackson's champion grade herd of the past two years, her sire being a grandson of Mr. S. Master's old "Chocolate," a 700 lb. butter-fat cow of some years ago. Mr. A. Krepp's "Lady" (518 lb. butter-fat), brings a new name to the list. Her yield was made at

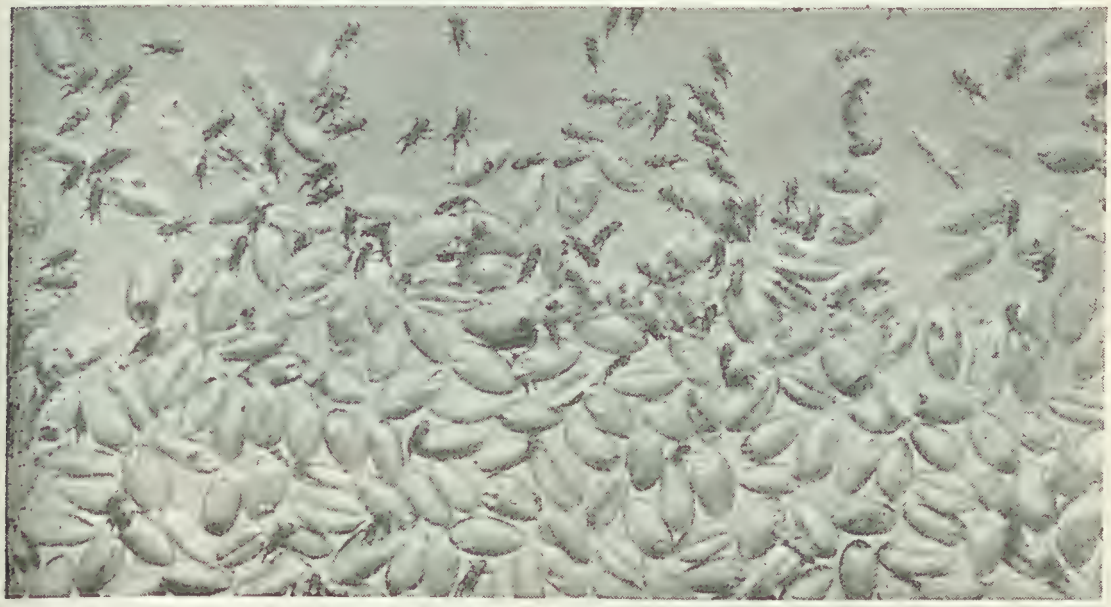
LIST OF LEADING THREE-YEAR-OLDS.

Owner.	Association.	Name of Cow.	Milk.	Test.	Butter-fat.
			lb.		lb.
J. A. Newton	Myrtleford–Whorouly ..	Robin	13,533	4·10	555
E. C. Wines	Woodford	Brindle	8,880	6·25	555
L. H. Semmens ..	Maffra No. 1 ..	Merrilyn Queen ..	9,530	5·62	536
Fuller Bros.	Dumbalk	Susan	10,793	4·93	532
H. R. Heath	Leitchville	Dock	8,928	5·94	531
T. Lee	Cohuna	Alice	16,050	3·29	529
A. J. Crombie ..	Dumbalk	Snifter	8,967	5·90	528
R. Cox	Swan Hill	Sylvie	10,026	5·24	526
J. G. Howell	Leongatha No. 1 ..	Lady	9,444	5·50	520
E. W. Croucher ..	Myrtleford–Whorouly ..	Little Star ..	10,249	5·06	519
H. F. McRae	Rochester No. 1 ..	Madam	7,709	6·61	510
J. J. Wilson	Toora–Welshpool ..	Clinker	9,604	5·29	508
J. Sinclair	Rochester No. 1 ..	Sally	13,008	3·89	507
J. D. Campbell ..	Kerang	Ina	9,446	5·36	506
Geo. Grey	Condah Swamp ..	Mavis	7,630	6·63	506
J. G. Howell	Leongatha No. 1 ..	Linda	8,543	5·88	502

[Continued on page 547.

Weevil Damage to Stored Grain

By R. T. M. Pescott, M.Agr.Sc., F.R.E.S., Entomologist



Weevils in a sample of grain.

CONTRARY to general belief, if clean wheat is harvested with clean machinery, bagged in clean bags and stored in surroundings which are free from weevils and free from outside contamination, it will remain free from weevil attack for an indefinite period. Unfortunately, such a state of affairs very rarely occurs in actual practice, and through the inroad of "weevils" at one or more points, a sample of grain soon becomes contaminated. Such contamination usually becomes very severe during the second year of storage.

It is the national duty of every farmer, and every person handling wheat and other grain, to see that this season the wheat from the farms arrives at the country elevator or the country siding in a sound and pure condition. It should be remembered that during the World War of 1914-18, when large quantities of wheat had, of necessity, to be stored in this country over long periods, weevil attack became very severe. It has been reliably estimated that at some wheat depots during that period as much as forty tons of wheat per day was destroyed by weevil attack alone.

Where does this weevil trouble start and how can it be avoided? These are natural questions which will be asked by many farmers during the coming season, and the following factors are all of importance in one way or another in weevil attack :—

Grain in the Field.

Under Victorian conditions initial weevil infestation of grain does not take place in the field, as it can do in some parts of Australia, and in other countries of the world. It is thus possible, providing clean machinery is used, to harvest a perfectly clean sample of grain. There is no truth in the popular belief that in every grain of wheat, as it is produced in the field, there is a weevil "germ," which as soon as conditions are suitable will develop into a live weevil.

The condition of the grain at harvest time is, however, of vital importance where the

future storage of the grain is concerned. It is a well-known fact that "damp" or "wet" wheat is very prone to weevil attack, while wheat which is well matured and dried to a moisture content of under 10 per cent. is fairly resistant to damage.

It is therefore recommended that farmers allow their wheat to ripen thoroughly, mature and dry out before being harvested, and not to consider harvesting it in a slightly immature or "green" condition. Numerous instances have been recorded in the past where farmers, particularly early in the season, have attempted to deliver wheat containing actual green grain and green straw and chaff. Such a practice on the part of one farmer may well cause serious losses to all other grain stored with the immature sample.

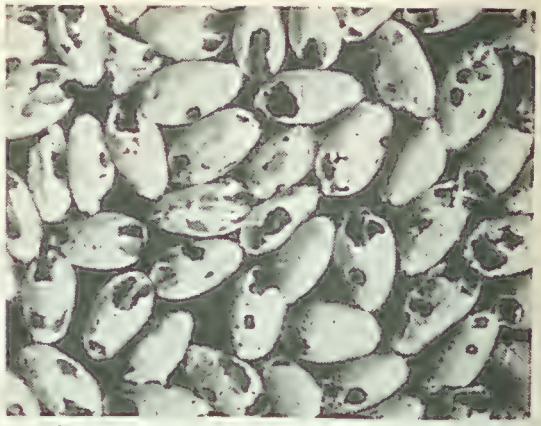
Harvesting Machinery.

Unless grain in harvesting machinery is thoroughly cleaned out immediately after harvest or prior to the new harvest, it constitutes a serious source of infestation of clean wheat from the field. The ideal time for doing this is immediately after harvest, before the weevils have found time to locate grain in the machine, but the present time is not too late to prepare for the coming harvest. Such places as the threshing drum, elevator belt and behind the cups, and at the bottom of the elevators, should be given particular attention. As additonal grain and dust will be shaken out from the cracks when the machine starts, it should be run empty for a few hundred yards, and then recleaned before entering the crop.

It is realized that there may be some difficulties associated with this cleaning, but it is pointed out that whatever attention is given will not only allow of a cleaner sample of grain to be delivered to the elevator or to the siding, but the farmer himself will know that his machinery is in good working order when the time to use it arrives.

Grain and Meal Stored on the Farm.

On the majority of farms, a certain quantity of wheat, barley or oats, or bran and pollard, is stored for the purpose of poultry and stock food. Seldom is the farmer's barn completely free from "weevils," and infestation is inevitable after a year or so. Contamination may also take place from produce when it comes



Wheat severely damaged by weevils.

from the country store. Both types of material are constant sources of infestation of new season's grain on the farm.

If new season's wheat has to be stacked on the farm for any length of time before being delivered to the silo or country siding, it should be stored as far away as possible from grain or meal stored in barns or sheds for poultry or stock food.

On another point, the farmer should be scrupulously honest. He should not, under any circumstances, "ring-in" old season's grain with new season's grain prior to delivery to the rail. This has frequently been done in the past without farmers realizing to the full the losses they may cause. A parcel of five or six bags only of old season's wheat delivered to the silo may easily prove a pocket of infestation which spreads to all parts of the silo. It is advisable that such wheat should be kept for poultry or stock food.

Treatment of Old Bags.

Wherever bagged wheat is delivered to the silos, new bags should be used in the first place if possible. If this is done, one serious source of infestation of otherwise clean grain will be overcome. It is realized that certain circumstances prevent this being done, and, if secondhand bags have to be used, they should be treated prior to use. Old bags which have been stored in the same barn or shed with grain, bran or pollard, are particularly liable to have "weevils" present.

The first thing to do with these bags is to turn them inside out and thoroughly shake and brush out any grain, dust or insects present. The bags then should be hung over a wire or wooden fence in the sun for a period of several days, and not taken back to the infested barn.

[*Continued on page 551.*

A Valuable Pasture Plant — Seed Harvesting Methods

By F. Drake, B.Agr.Sc., Assistant Agrostologist

As an ingredient of seeds mixtures for the establishment of permanent pastures in Southern Victoria, cocksfoot takes second place only to perennial rye grass. It is not, however, so widely grown in Victoria as perennial rye grass, being, to a large extent limited to areas with a deep porous soil and good summer rainfall.

Cocksfoot makes its main growth during the late spring and summer, and although it is able to withstand dry spells very well when once established, it is unable to give full expression to its capacity for high spring and summer production unless it receives good rains during its normal growing period.

Its ability to withstand dry spells is attributed to its very deep rooting habit, but unless the soil is deep and porous, this character is not fully developed, and the plant does not thrive with its potential luxuriance.

In deep porous volcanic and peaty soils, rye grass is much less persistent and successful than cocksfoot, consequently in such soils in the higher rainfall districts cocksfoot is the more important grass. The two grasses often grow well in association on the heavier soils in such districts, but in the lighter rainfall districts and plains country, with a normally dry summer, cocksfoot is rarely found in any quantity. Attempts to grow it in such places have been only partially successful and probably unprofitable. Even if successfully established, the plants are always small and relatively unproductive, and very likely to be eaten out altogether under the close grazing which prevails when every green leaf is eagely sought after during the summer.

The behaviour of cocksfoot in the pasture plant research field at Burnley illustrates its limitations. Here, with an average annual rainfall of 26 inches, it grows quite well as widely spaced single plants, with the soil cultivated between the plants. When sown broadcast in a sward, however, the plants never reach large size, and although persistent, produce very little herbage. Under Burnley conditions cocksfoot yields a great deal less as a sward than rye grass, and its value in producing a little more green leaf during the summer is more than offset by its very much lower yield over the whole year.

Thus, while cocksfoot is a grass of the first importance where conditions are favourable for its normal rhythm of growth, it should not be sown unless conditions of soil and climate are likely to allow reasonably full expression of

its qualities. Cocksfoot is a strongly growing plant, which is likely to become weakened if closely grazed and the crown exposed. It is better suited therefore to cattle than to close sheep grazing.

It grows well in association with sub-terranean clover on the lighter soils, and in association with rye grass, sub-terranean clover, and sometimes white clover on the heavier, grey soils. It is a good hay grass provided it is cut before becoming too mature, and in a good season will provide an excellent aftermath following the hay cut.

Cocksfoot has proved a valuable element in mixed pastures grown under irrigation.

Cocksfoot Strains.

In a line of cocksfoot grown as single plants, great variations from plant to plant may be noticed. For example the plants may vary in their capacity for total production, and also in the proportion of leaf to stem.

Plants which produce a high proportion of leaf are more desirable, and usually more productive, than those of a sparse, stemmy nature which are less palatable and nutritious than leafy plants.

While no one line will consist entirely of plants of one type or the other, and all possible intermediate types occur, any one line usually tends predominantly towards one growth form or the other.

Supplies of cocksfoot seed used in victoria have been drawn in the past from three main sources—Denmark, New Zealand, and Victoria. It has been shown that Danish seed gives rise to plants which are mainly of the stemmy type, and as an added disadvantage are very "winter dormant."

New Zealand seed, and particularly New Zealand Certified seed, usually produces plants of the leafy type.

The investigations at Burnley, together with the experiences of farmers who have used all kinds of seed, have shown that seed of Victorian origin also, usually gives very satisfactory results. In fact, there exists in Victoria a vast reservoir of cocksfoot of a type equal to and, for local usage, probably superior to anything which can be imported, and which so far has been very lightly drawn upon.

The Present Seed Position.

In spite of fairly general recognition, both by merchants and farmers, of the inferior qualities as a pasture plant of Danish cocksfoot, large quantities of seed, amounting to nearly half the Victorian consumption were being imported from Denmark until the recent occupation of that country by Germany. Danish seed has been able to hold a place because of its excellent appearance as a seed sample, and because it could usually be imported at fairly low cost.

From one point of view the exclusion of this inferior type need cause no regret. On the other hand, the replacement of this large quantity of seed, with seed of a better type

Cocksfoot plant types in the Plant Research Field at Burnley, Victoria.

of cocksfoot, points to the necessity for expanding the seed harvesting industry within the State.

Some doubt has been expressed regarding the ability of New Zealand not only to make up the difference, but even to continue her normal shipments to Victoria. It is reasonable to assume that fairly large stocks of seed are held in store so that an immediate shortage is not expected. However, falling stocks will result in rising prices, with consequent diminished use by farmers.

Cocksfoot is such a valuable grass for certain purposes, that any shortage or unduly high price for the seed would be unfortunate, and would tend to affect production unfavourably in Victoria and particularly the dairying industry.

Cocksfoot ready for harvesting.

Harvesting and Handling the Seed.

The harvesting of cocksfoot seed has been less extensively practised in Victoria than the harvesting of rye-grass seed. One reason for this is that the cooksfoot crop does not lend itself so readily to the large scale mechanized methods of harvesting used in the case of rye grass. For abundant seed production the crop must be much more fully protected from grazing than rye grass, which may be relied upon to throw up a profitable seed crop in a very short period, if seasonable conditions are favourable. Those who have had most experience with cocksfoot generally agree that for worth-while seed production, the less it is grazed the better.

The cocksfoot plant produces many so-called "barren" or non-stemming shoots, and only a few stalky or flowering and seeding shoots. These latter commence to form early in the season, and develop slowly, so that a long period of protection from grazing is required for the development of the maximum number. The better, leafy type of cocksfoot produces fewer seeding stems than the inferior Danish type, thus accentuating the need for protection if profitable yields of seed are to be obtained.

It is necessary to secure areas as clean as possible, and in particular free from the presence of other grass. This is another reason for the necessity for very restricted grazing.

Cocksfoot is a tall, rough growing grass, and does best when the crown is heavily shaded by rank growth. Few other grasses will tolerate such heavy shading, and under such conditions, competitors are crowded out, and a fairly pure stand is obtained.

Thus there is a tendency to rely for seed on those areas which are naturally lightly grazed or wholly protected, such as roadsides, railway cuttings, and the headlands of crop paddocks. Few farmers have systematically set aside and managed large areas specially for seed production. The industry has developed more as a side line, small protected areas being cut for seed by hand. A few farmers, however, have given the industry more serious attention, with usually quite profitable results.

Where the seed is harvested by hand, a sickle is most commonly used, and this enables weeds and foreign grasses to be largely avoided. The stage of maturity at which to cut requires some judgment, and a careful watch should be kept as the grass matures. Cutting may commence when the seeds are formed, and the heads taking on a golden colour, but before natural shedding is in progress. If cut too green, threshing will be difficult and incomplete and the seed light, while, of course advancing maturity will be accompanied by increasing loss of seed. The cut heads are gathered into small bundles and left to dry on the stubble.

The time between cutting and threshing will depend on the weather, and when hot,

four or five days is sufficient. Trouble with rats and mice attacking the cut bundles in the fields is sometimes experienced.

Threshing of hand-cut material is usually done with a flail and is attempted only in hot, dry weather. After threshing, the straw is sieved off. The seed is winnowed to remove as many of the light and empty seeds as possible, and further cleaned by whatever methods are available.

Cutting by hand of half an acre in a day is regarded as a good day's work, and as the period in which the seed is fit to gather is comparatively short, the quantity which can be harvesetd by hand is strictly limited to the labour available. Where large areas of reasonably level country are specially protected for a seed crop, the grass may be cut with a reaper and binder.

The period over which cutting may continue depends entirely on the weather, and may extend up to a fortnight, but in hot weather, the critical period may be as short as four or five days, and cutting confined to the cooler parts of the day to reduce loss by shattering.

The sheaves are allowed to lie on the stubble until the exposed side is bleached, and are gathered into windrows with another face exposed on the first wet day after cutting. If further rain falls, the sheaves must be moved again; otherwise they may be threshed as soon as thoroughly dry. In either case, threshing is done direct from the field. The sheaves are not stacked, and at all stages must be handled as carefully as possible to avoid loss. Threshing is done by machine, and the material from the thresher bagged and re-cleaned as opportunity offers.

The final cleaning of the seed into a sample conforming to the standards required under the Victorian Seeds Acts, is often the most difficult part of the job, and sometimes requires the use of specialized seed cleaning machinery, which is beyond the scope of the average grower. The regulations, which permit the presence of 20 per cent. of inert matter (chaff, empty glumes, &c.), 1 per cent. of weed seeds, with a special allowance for 6 per cent. of rye-grass seed, cannot be regarded as unduly exacting.

If seed is hand cut and care is taken to avoid heads of foreign plants, of which Yorkshire fog grass is the commonest, it should be possible to reach the above standard by ordinary winnowing and sieving methods. When harvesting by machine, however, such careful selection is not possible, and a dirtier sample off the thresher must be expected.

Shortage of adequate and efficient seed cleaning machinery, more than anything else, has limited the development of a well organized and adequate cocksfoot seed growing industry in Victoria. The other serious limiting factor has been the competition from Danish seed. While merchants have been able to obtain supplies of imported seed at favourable prices, they have not been disposed to encourage the local industry. But with imports severely curtailed the availability of seed cleaning facilities remains the chief bar to expanded production. It is felt that merchants, handling the seed on a fairly large scale, are in a better position to provide such facilities than the average grower, who usually handles quite a small parcel of seed.

The chief difficulty seems to be the valuation of farmers' dressed lines, which require further cleaning before they can be sold as seed for sowing. There should be no real trouble, however, in arriving at an equitable arrangement. This could, if necessary, be based on laboratory determinations of purity and germination of a representative sample of the line offered, with allowance for cost of cleaning, especially of very dirty lines.

There would appear, therefore, to be good reason and even an actual need for an orderly expansion of the cocksfoot seed harvesting industry within Victoria. Adequate areas of suitable grass exist, but more attention to mechanical harvesting methods, and the development of seed cleaning facilities is called for. One may suggest that a better understanding between merchants and growers than perhaps has existed in the past would give a stimulus to production.

If the industry can be sufficiently expanded to permanently replace imports of a relatively inferior cocksfoot with seed of the more leafy and productive Victorian type, those responsible will have performed a notable service to the consumers of cocksfoot in Victoria, and also other parts of the Commonwealth.

Mallee Research Station

Experiments and Results

By H. L. Hore, B.Agr.Sc., Inspector of Agriculture, H. J. Sims, M.Agr.Sc., Manager, and C. G. Webb, B.Agr.Sc., Science Field Officer

THE Mallee Research Station was established in 1932 to serve as the centre for investigating problems affecting the north-western areas of the State. Its establishment was made possible by the decision of the Government of the day to allot for that purpose portion of the Wheat Marketing Fund, which was derived from the sale of Rumanian bonds accepted in payment for wheat delivered during the 1914–18 war. In addition to establishing an agricultural research station in the Mallee, Wheat Marketing Fund money has also been used to erect and equip a cereal laboratory at the State Research Farm, Werribee, and to purchase milling equipment installed in the cereal section of the State Laboratories.

The decision to establish a research station in the Mallee was influenced by the fact that the Wimmera, the Goulburn Valley, and the North-East all had their State institutions, but the Mallee, comprising 11,000,000 acres, or one-fifth of the State, had no permanent institution for research work at which a resident staff could attack the problems.

The policy was adopted of locating the experiment station at the geographic and climatic centre of the Mallee, but before doing so, the advantages and disadvantages of twelve areas in various parts of the Mallee were considered. An area of 1,928 acres of Crown land 1½ miles from the Walpeup township was selected and permanently reserved for use as an experiment station by the Department of Agriculture. Most of the area was virgin uncleared land, but development has proceeded so that at the present time approximately 830 acres are available for cropping. A broad scale timber and soil survey of the whole farm is being carried out as the development continues. As it was intended, the station is serving as a centre for research and investigation into wheat-growing and allied problems in the Mallee, and the results obtained at Walpeup are demonstrated under local conditions in district experimental plots at Werrimull, Ultima and Woomelang.

Experimental work is being conducted on a large scale. This year 166 acres are sown to various plots. Of these, 127 acres are on fallow, 80 acres being devoted to cereals, principally wheat, 25 acres to cultivation experiments, and 22 acres to pasture trials. The remaining 39 acres of experimental plots are sown with oats on stubble land.

The bulk cereal crops for grain comprise the following varieties:—

Wheat.—Ghurka Selection, Regalia, Ranee 4H, Bencubbin, Baldmin, and Sepoy.

Oats.—Dawn and Mulga.

The grain obtained from these areas will be available for distribution among farmers as graded seed. Special precautions are taken to maintain its purity and trueness to type.

Of the wheat varieties being grown for seed Ghurka, Ranee 4H and Sepoy are well known to Mallee farmers. Regalia was released by the Department in 1938 and is the cross-bred wheat formerly known as Ranee x Free Gallipoli W5807. Of an early maturing type, it has proved its ability to yield well under Mallee conditions and closely resembles Ranee 4H in appearance.

Visitors inspecting the experimental plots on field day.

Baldmin is an early maturing variety which usually produces vitreous grain and flour of medium-strong quality. It is inclined to be weak in the straw and should be harvested promptly after ripening. Bencubbin is the leading wheat variety in Western Australia and is gaining in popularity in the drier portions of Victoria. It is a tall, fairly early maturing variety which, under some conditions, is definitely weak in the straw. It is resistant to flag smut and is considered the most suitable dual-purpose (grain or hay) type for the Mallee.

Ghurka Selection.—This new variety, which was produced by the Victorian Department of Agriculture, is to be released this year from the Mallee Research Station to growers in the Mallee. It is a selection from Ghurka, and is a distinct improvement on the parent variety in so far as flour quality is concerned; furthermore, its grain is larger and more attractive. Its yield in the Mallee has been good, but variable in comparison with Ghurka in other districts. In the Mallee the average increase in yield over its parent variety during the last three years has been 3.9 bus./ac. at this Station, 1.2 bus./ac. at Swan Hill, and 0.4 bus./ac. at Werrimull. Ghurka Selection is similar to Ghurka in disease resistance and field characteristics, except that it is slightly taller and a little earlier in maturity.

District Seasonal Conditions.

This season to date is the worst experienced since the establishment of the Research Station. Prospects at present are less favorable than at the same period during the drought of 1938. The total rainfall to October 15th was only 572 points.

The first two months of the year were mild and dry, while very hot weather was experienced during March. Nearly 1½ inches of rain was received in April, but most of this was in light falls, the heaviest recording being 42 points late in the month. This rain, and the showers following it, gave a germination of stubble-sown oats, and enabled fallows to be either worked or sown with wheat. Crops sown after these early rains came away satisfactorily, but where sowing was delayed till the middle of May, germination was patchy and confined to the sandy soil.

Only very light showers were recorded during May and June. Some heavier showers in July helped crops temporarily, but in August and September, rains were again very light. Strong winds and dust storms were experienced during the winter months. These, combined with the lack of rain, caused much damage to crops, and very light yields are expected.

The feed position at present is even worse. However, many lambs have been marketed in surprisingly good condition.

The monthly rainfall for the present year, and the averages over a 28-year period are as follow:—

Month.	1938.	1939.	1940.	Average 28 Years.
January	125	13	38	63
February ..	49	343	58	91
March	..	12	19	79
April	81	222	145	77
May	2	135	23	128
June	36	183	14	132
July	167	87	92	115
August	51	150	36	135
September ..	6	47	135	138
October	8	37	..	140
November ..	9	196	..	90
December ..	2	3	..	97
April–October ..	351	861	..	865
Total ..	536	1,428	..	1,279

EXPERIMENTS WITH WHEAT.

Wheat Manurial Trials.

This year's manurial trials with wheat were sown under the factorial design previously described, and each of the six quantities of superphosphate tested was included with the (*a*) early (April 26th), (*b*) mid-season (May 18th), and (*c*) late (July 12th) sowings.

The results of the 1933–39 trials are set out in Table I., and show clearly the marked response to superphosphate at each time of sowing.

Table I.—Wheat Manurial Trials, Average Seven Years, 1933 to 1939.

Treatment.	Sown Early.	Sown Mid-Season.	Sown Late.	Average Three Times of Sowing.
	bus./ac.	bus./ac.	bus./ac.	bus./ac.
No manure ..	24·4	24·4	18·6	22·5
Super, 30 lb. p.a.	27·5	26·7	21·4	25·2
,, 60 lb. p.a.	29·7	28·0	22·6	26·8
,, 90 lb. p.a.	30·7	28·9	23·8	27·8
,, 120 lb. p.a.	31·8	29·6	24·5	28·6
Average yield ..	28·8	27·5	22·2	..

It will be seen by an examination of the preceding table that an increase in the yield of wheat was obtained with each addition in the amount of superphosphate applied. Moreover, and contrary to the generally accepted idea, the tests over seven years indicate that early-sown crops require superphosphate to as great an extent as do those sown later. During the last four years dressings of 150 lb. per acre were included in this test, in order to determine if a further increase in yield was obtainable. The results are shown in the following table:—

TABLE II.—WHEAT MANURIAL TRIALS, AVERAGE FOUR YEARS, 1936 TO 1939.

Treatment.	Sown Early.	Sown Mid-Season	Sown Late.	Average Three Times of Sowing.
	bus./ac.	bus./ac.	bus./ac.	bus./ac.
No manure ..	28·5	27·0	20·2	25·2
Super. 30 lb. p.a.	32·0	29·3	21·7	27·7
" 60 lb. p.a.	33·2	30·0	22·4	28·5
" 90 lb. p.a.	34·1	30·7	23·9	29·6
" 120 lb. p.a.	34·8	31·1	24·5	30·1
" 150 lb. p.a.	34·5	31·1	24·8	30·1
Average yield ..	32·8	29·9	22·8	..

The application of 150 lb. of superphosphate per acre did not materially alter the yield from that obtained with 120 lb. per acre.

The results of the manurial trials at Walpeup over the last fifteen years are set out in Table III. This Table shows the increased returns which may be expected from the various applications of superphosphate when wheat is valued at 2s. 6d. per bushel at country sidings, and superphosphate at £5 10s. per ton on the farm.

TABLE III.—WHEAT MANURIAL TRIALS.—AVERAGE RESULTS 15 YEARS.—MID-SEASON SOWING.

—	Average Yield 15 Years.	Increase due to Super.	Value of Increase at 2s. 6d. per Bushel.	Cost of Super. at £5 10s. per Ton.	Extra Return per Acre, due to Super.
	bus./ac.	bus./ac.	s. d.	s. d.	s. d.
No Manure ..	19·1	..	..	..	..
Super. 30 lb. p.a.	21·8	2·7	6 9	1 6	5 3
" 60 lb. p.a.	23·2	4·1	10 3	3 0	7 3
" 90 lb. p.a.	24·2	5·1	12 9	4 6	8 3
" 120 lb. p.a.	24·6	5·5	13 9	6 0	7 9

From these results it appears that, under conditions similar to those at Walpeup, the most profitable dressing for wheat on fallow is about 90 lb. per acre, when wheat on the farm is valued at 2s. 6d. per bushel.

Sheltered stable and yards at the Mallee Research Station.

In addition to the manurial trials on fallow land, tests with superphosphate on stubble land were commenced in 1937. This section of plots will provide a valuable guide to manurial applications for stubble-sown wheat crops.

The results obtained to date indicate that when sown on stubble ground which has been adequately manured with the preceding crop, wheat, like oats, does not respond to heavy dressings of superphosphate. Applications of approximately 30 lb. per acre appear to be all that is warranted.

TABLE IV.—WHEAT MANURIAL TRIAL. STUBBLE GROUND.

Average results 3 years, 1937–39.

Treatment.	Yield.
	bus./ac.
No manure	12·7
Super. 30 lb. p.a.	13·6
„ „ 60 lb. p.a.	13·7
„ „ 90 lb. p.a.	13·7

Minor Element Trials.

The discovery that optimum plant growth is produced only when there is present in the soil, in addition to the more commonly recognized essentials, small amounts of certain minerals other than phosphate, nitrate and potash, has greatly widened the scope of experimental work in recent years. It is indeed fortunate that, because these minor elements are needed only in small amounts, they are usually present in sufficient quantities in most soils, and the occurrence of deficiency areas is therefore relatively rare. Recent work, however, has indicated that a number of areas in Australia respond to the application of one or the other of these minor elements, and the Department is investigating many districts in Victoria from this point of view.

In order to determine if the Mallee district of this State is possibly one of these deficiency areas, a "minor element" trial was commenced at Walpeup in 1938. A series of wheat plots was sown on fallow land with a basal dressing of 90 lb. of superphosphate per acre and, in addition, various minerals were added when sowing certain plots. The results from this trial gave no indication of increased yields due to the addition of these minerals with the superphosphate.

The experiment was repeated in 1939 with slight modifications in the rates of application of some of the minerals. In addition to the wheat plots, oat plots which received the same treatments were sown and harvested for hay. The results (Table V.) again show no significant increases in yields due to any of the minerals.

TABLE V.—MINOR ELEMENT TRIAL, WALPEUP, 1939.

Sown Midseason.

Treatment.	Yields.	
	Wheat. bus./ac.	Oats. cwt./ac.
Superphosphate, 90 lb. per acre ..	26·8	37·0
Super. 90 lb. + Zinc Sulphate, 20 lb. p.a.	28·1	36·8
„ „ + Magnesium Sulphate, 56 lb. p.a. ..	27·3	35·8
„ „ + Borax, 5 lb. p.a. ..	27·2	34·3
„ „ + Copper Sulphate, 15 lb. p.a. ..	27·0	38·0
„ „ + Iron Sulphate, 56 lb./ac. ..	26·9	37·6
„ „ + Manganese Sulphate, 30 lb./ac. ..	26·1	36·4
„ „ + Potassium Sulphate, 90 lb./ac. ..	25·4	35·5

Note.—Yield differences of 1·6 bushels per acre and 3·5 cwt. per acre are necessary for significance between treatments.

This year the above treatments have been confined to rows of wheat and located on a very limey patch of ground. Care should be exercised in the use of some minor elements as their indiscriminate application may prove detrimental both to the crop and the soil to which they are applied.

Cereal Breeding and Wheat Variety Trials.

The production of new superior varieties of wheat, oats, and barley by hybridization and selection, and the subsequent development and testing of these forms, provide one of the most important and extensive aspects of the research work being conducted at the farm. Each year a large number of matings of desirable parents is made, and the progeny of these are grown and studied in nursery rows in the stud Cereal Plots. These rows are subjected to a drastic culling, and only those plants exhibiting desirable characters are retained for further selection and testing.

This selection work is continued for a number of years until only a few of the more promising true breeding strains of the original population are left. These are then grown in seed multiplication plots and finally pass to the larger field plots for accurate testing to determine their yielding capacity.

Varieties considered worthy are finally tested over a period of years in exhaustive replicated yield trials repeated in each season at three times of sowing, viz., early (April), mid-season (May), and late (June).

The success achieved by wheats such as Ranee 4H and Ghurka in the past illustrates the value and possibilities of varietal improvement. When the best of the new crossbreds now growing at the Station are distributed, still greater progress will be made.

TABLE VI.—TEN PRINCIPAL WHEAT VARIETIES SOWN IN THE MALLEE.

(As estimated by the Government Statist.)

Variety.	Acres, 1940–41.	Percentage 1940–41.	Percentage, 1939–40.	Percentage, 1938–39.
Ghurka	508,115	41·1	41·8	42·9
Ranee (including 4H)	343,290	27·7	31·3	30·1
Bencubbin ..	95,050	7·7	5·3	4·2
Free Gallipoli ..	52,550	4·2	5·3	6·2
Dundee ..	46,110	3·7	4·2	4·2
Regalia ..	40,930	3·3	..	..
Bobin	36,460	2·9	2·3	1·8
Sepoy	31,580	2·6	3·2	3·8
Rajah	28,080	2·3	2·1	2·1
Nabawa ..	11,870	1·0	1·0	1·1
Mac's White ..	..	..	0·6	1·0
All other ..	42,965	3·5	2·9	2·6
Total ..	1,237,000	100·0	100·0	100·0

Ghurka and Ranee 4H have been the principal varieties recommended and grown in the Mallee in recent years.

Ranee 4H is sown chiefly in the northern Mallee, while Ghurka is more popular further south.

Work over the past three years has demonstrated the possibilities in the Mallee of Baldmin, Bencubbin and Regalia (formerly known as crossbred Ranee x Free Gallipoli W5807 J5–1–1).

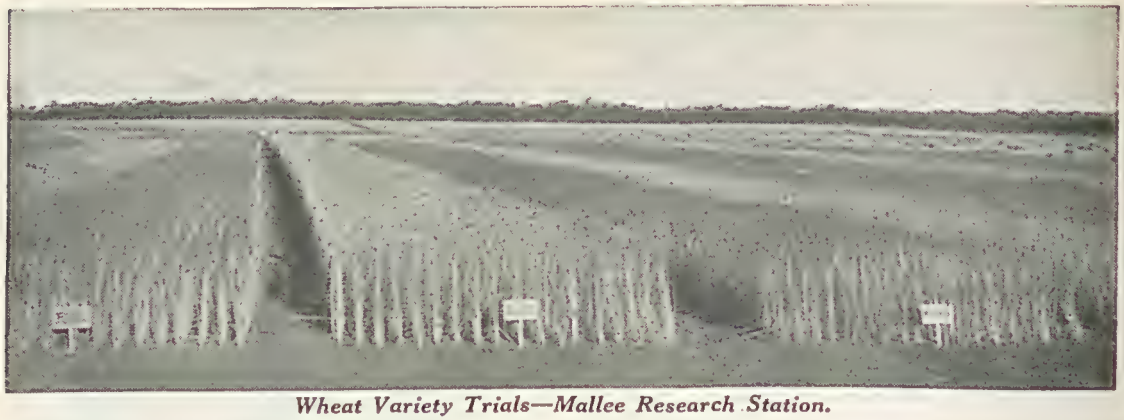
At the Mallee Research Station, Walpeup, the superiority of Baldmin and Bencubbin has been marked, while at Swan Hill and Werrimull they yielded as well as the standard varieties.

Typical heads of Regalia. This new variety was sown on 40,930 acres in Victoria in 1940.

Baldmin is a white-chaffed, early maturing variety, which has shown high yielding ability in practically all tests throughout the wheat belt. Bencubbin is also an early maturing wheat, which has yielded particularly well in the lower rainfall areas of the State. Because of its tall straw, it is suitable as a hay type of wheat.

Owing to their capacity to yield well even under low rainfall conditions, an extension of the area sown to each of these varieties in the northern Mallee is warranted. Both wheats, however, show a tendency to weakness in the straw, and for that reason the area sown by individual farmers should be limited to that which can be readily handled and the crop harvested as soon after maturity as practicable.

Regalia, which was named and released to growers as recently as 1938, was sown on 40,930 acres this season. It is a very early



Wheat Variety Trials—Mallee Research Station.

maturing variety, and possesses better straw characteristics than most of the other early varieties. Regalia has given higher returns than Ranee 4H and Ghurka at the Mallee Research Station, over a period of seven years, and at Werrimull, in the Millewa District, it has been the best yielding wheat tested for the past six years.

Milling and baking tests indicate that, so far as quality is concerned, Baldmin regularly produces medium strong flour, Bencubbin is superior to both Ranee 4H and Ghurka as a low strength wheat, while the grain quality characteristics of Regalia closely resembles those of Ranee 4H, are superior to those of Ghurka, and very superior to those of Rajah.

The variety Dundee has not been outstanding in any experimental plots in the Mallee. It is susceptible to rust, and although classed as a medium to strong wheat, it produces flour

TABLE VII.—WHEAT VARIETY TRIALS IN THE MALLEE.

Yields in Bushels Per Acre.

Variety.	Walpeup.	Mallee Research Station, Walpeup.		Swan Hill.			Werrimull.			Rainbow.
	Average 14 years, 1925–39.	Average 7 years, 1933–39.	Average 3 years, 1937–39.	Average 9 years, 1931–39.	Average 5 years, 1935–39.	Average 3 years, 1937–39.	Average 6 years, 1934–39.	Average 4 years, 1936–39.	Average 3 years, 1937–39.	Average 8 years, 1929–36.
Ranee 4H ..	25·0	29·6	31·1	25·0	26·7	27·7	15·1	16·0	14·1	21·7
Regalia	..	29·8	31·8	..	26·5	27·6	15·3	17·1	14·8	..
Bencubbin ..	..	30·6	32·2	..	26·1	27·7	..	16·5	14·8	..
Baldmin	..	..	32·9	..	26·3	27·6	..	15·8	13·4	..
Ghurka Selection, W5950 5 ..	..	..	31·3	..	..	28·1	..	..	12·5	..
Ghurka	24·0	26·8	27·4	26·0	26·3	26·9	14·2	14·2	12·1	23·9
Magnet (Major x Free Gallipoli) ..	..	..	30·0	..	..	28·3	..	15·3	12·3	..
Sepoy	24·5	27·6	26·5	26·2	27·5	28·8	..	15·7	13·4	..
Ranee x Free Gallipoli, W5899 ..	..	..	32·3	..	..	26·3	..	..	14·4	..
Major x Ranee, W6021	..	..	31·2	..	..	..	..	..	..	..
Gular	..	..	30·0	..	..	..	..	..	..	..
Free Gallipoli ..	..	..	..	25·4	25·8	25·7	..	..	..	21·5
Dundee	..	..	29·0	..	25·2	26·2	..	14·8	12·6	..
Rajah x Gallipoli, W6491	..	..	27·7	..	..	27·1	..	14·5	12·3	..
Ghurka x C.M-G., W5530	..	..	..	..	..	26·7	..	..	12·0	..
Major x Ranee, W6025	..	..	26·2	..	..	27·5	..	14·2	11·9	..

NOTE:—Ranee 4H replaces Ranee from 1928, onwards.

Stud Rows of Wheat and Oats.

of irregular quality. Dundee is not recommended for the northern Mallee, and in the southern Mallee limited sowings only are recommended.

The varieties recommended for the Mallee are:—

—	Main Sowing.	Limited Sowing.
Northern Mallee	Ranee 4H Ghurka Regalia	Ghurka Selection Baldmin Bencubbin Sepoy
Southern Mallee	Ghurka Ranee 4H	Baldmin Dundee Regalia Free Gallipoli

Ghurka Selection, which has demonstrated its superiority over Ghurka during the past three years in all tests in the Mallee, should prove to be a popular wheat among farmers in this area.

Variety tests in the past have resulted in the elimination of many older wheats, such as Federation, Early Gluyas, Mac's White, Yandilla King, Currawa, Joffre, Nabawa, Rajah, Waratah, and Free Gallipoli.

Each year the performances of all the varieties and crossbreds in the various variety trials at the station are reviewed. Those which do not yield satisfactorily over a period of years, or have undersirable characteristics, are eliminated, and are replaced in their various sections by promising varities or crossbreds from junior trials. Crossbreds that prove superior to standard varieties in yielding ability, and are satisfactory as regards milling and baking quality, disease resistance, and harvesting characteristics, are submitted to the Victorian Wheat Advisory Committee, with the recommendation that they be named and released for sowing.

All yield trials are replicated, and, in addition, the final tests are sown early, midseason, and late during each season.

The Research Station figures given above are the average of early and midseason sown tests.

At this stage it is unnecessary to give detailed results of the many varieties and new wheats under test. Of those drawn from other States, Bencubbin has been the most successful, and Gular, an early maturing variety from New South Wales, may be suitable in the Northern Mallee. It produces medium strong grain, but is weak in the straw. Others, such as Carrabin, Ford, Baringa, Merredin, Riverina, Totadgin, Nawab and Sword, are not considered equal to the standard wheats. An improved selection of Sword, known now as Rapier, is under test this year. Of the new crossbreds, Major x Free Gallipoli, recently named Magnet, has given the best yields of the late-maturing varieties over three years, but is not recommended for the Mallee, and seed is available for the Wimmera only.

There are several new crossbreds which appear to combine high yielding ability with satisfactory grain and flour quality, the best being Ghurka x Ranee M 5174, Major x Ranee W 6021, Currawa x Ranee M 6029.

As an appreciable proportion of the wheat crop in the Mallee is sown each year on stubble land, the area varying considerably according to seasonal conditions but usually in the vicinity of 15 per cent. of the total area sown to wheat, variety trials on stubble land have been introduced. The results obtained so far indicate that for stubble sowing an early maturing wheat is desirable.

TABLE VIII.—WHEAT VARIETY TRIAL ON STUBBLE.

Average Yield, Three Years—1937-39

Variety.	Bus./ac.
Regalia	14·2
Ranee 4H	14·2
Bencubbin	13·1
Ghurka	13·1

Stud Plots.

Each year a number of plants considered to be desirable parents are mated at the State Research Farm, Werribee, the progeny being grown and studied in the nursery rows of the stud cereal section at Walpeup. An opportunity is thus being given the plant breeder to examine the new varieties growing under Mallee conditions. In this way, the various factors which go to make up a prolific variety are studied at an early stage in the life of the new crossbred or selection, and those showing weakness of any description are discarded.

The rows have been subject to drastic culling and selection each year, and some 40 wheat and 10 oat selections have now reached the stage when it is considered desirable to multiply the seed and test the selections in small replicated plots.

In addition to the above, several varieties are sown for observation purposes. These include Eureka, Fedweb 1, Fedweb 3, Mitchell, Gluclub, Golden Gallipoli and Queen Beth.

A museum section also is included. This comprises varieties that have been discarded from variety trials, and popular wheats from other countries.

Rate of Seeding Trial.

During the period 1933-37, a rate of seeding trial, designed to test four rates of seeding, namely, 30 lb., 45 lb., 60 lb., and 75 lb. per acre was conducted, and, as in the other major trials, the plots were sown at the three periods —early, mid-season, and late. The average results of the trial for the years 1933 to 1937, shown in Table IX., indicate that during those years variations in the rates of seeding did not have any market effects on the yields obtained. These tests, however, were conducted on land comparatively free from weed growth.

TABLE IX.—RATE OF SEEDING TRIALS, AVERAGE FIVE YEARS, 1933-37—REPLICATED.

Rate of Seeding.	Early.	Mid-season.	Late.
	bus./ac.	bus./ac.	bus./ac.
30 lb. per acre ..	30·6	26·0	26·0
45 „ „ ..	31·7	25·8	26·2
60 „ „ ..	31·4	25·8	25·6
75 „ „ ..	31·3	25·1	25·6

During the first four years of this test the variety sown was Ranee 4H, and in 1937 Ghurka was used. It is generally accepted that as seeding progresses the rate of seeding of the wheat crop should be increased, but the above results indicate that there is little to be gained by sowing more than 45 lb. per acre on relatively clean land. This was again confirmed last year, when the trial included three varieties of wheat (Ranee 4H, Ghurka, and Regalia), each sown at 20 lb., 40 lb., and 60 lb., of seed per acre, and at three times of sowing. Table X. shows the average yield obtained from the three varieties.

TABLE X.—RATE AND TIME OF SOWING TRIAL.

Average Yield, Three Varieties.

Treatment.	Sown Early.	Sown Midseason.	Sown Late.
	bus./ac.	bus./ac.	bus./ac.
Seed, 20 lb. per acre ..	33·7	27·8	20·0
„ 40 „ „ ..	34·0	28·3	20·5
„ 60 „ „ ..	34·1	28·3	20·0

Although optimum seeding rates may be governed to some extent by the variety of wheat sown, none of the varieties included in the above trial has shown any significant variation in yield due to a rate of seeding within the limits of 20 lb. to 60 lb. per acre.

TABLE XI.—RATE OF SEEDING TRIAL (SOWN MID-SEASON), AVERAGE TWO YEARS, 1938–39.

Rate of Seeding.	Regalia.	Ranee 4H.	Ghurka.
	bus./ac.	bus./ac.	bus./ac.
Seed, 20 lb. per acre ..	27·0	26·0	23·7
„ 40 „ „ ..	27·2	26·4	24·2
„ 60 „ „ ..	27·5	26·2	23·0

Experiments during the past two years also indicate that the response to superphosphate is not significantly affected by the rate of seeding of the crop.

Heavier sowing may be justified on land liable to drift severely, or where competition from weeds is to be expected. A trial has been included this year to test rates of seeding on land where competition from weeds is probable.

Time of Sowing Trials.

In the Mallee, highest yields are usually obtained by sowing early, provided that the land is reasonably free from weeds. In seasons with a dry spring, late sown crops seldom yield equal to those sown early, but, as in recent years, late spring rains sometimes benefit late sown crops to a greater degree.

TABLE XII.—TIME OF SEEDING TRIALS, AVERAGE RESULTS, FIVE YEARS, 1932–36.

Variety, Ranee 4H.

—	Average Yield Sown Early.	Average Yield Sown Mid-season.	Average Yield Sown Late.
Time of sowing trial ..	bus./ac. 30·2	bus./ac. 27·2	bus./ac. 24·3

In order to gain further information regarding the effect of time of sowing on the yield of wheat varieties, this trial has been enlarged to include an early, mid-season, and a late variety, namely, Ranee 4H, Ghurka, and Sepoy, sown at twelve-day intervals throughout the seeding period.

Results from this trial also confirm the superiority of early sowing and show the importance of the incidence of the spring rainfall in relation to the time of heading and flowering of wheat in determining the yield of the crop.

Permanent Rotation Trials.

To obtain more definite information as to the effect of crop rotation on the yield of cereals, and soil fertility, a permanent rotation trial has been commenced in Field No. 1. This trial consists of twelve rotations, two, three, and four course, replicated four times. The rotations are as follow:—

1. Wheat, oats grazed, fallow.
2. Wheat, barley, fallow.
3. Wheat, wheat, fallow.
4. Wheat, oats for hay, fallow.
5. Wheat, pasture, fallow.
6. Wheat, oats for grain, fallow.
7. Wheat, oats grazed scarified in October.
8. Wheat, fallow.
9. Barley, fallow, oats for hay, fallow.
10. Wheat, oats for hay, oats fed off, fallow.
11. Wheat, pasture, pasture, fallow.
12. Wheat, oats for hay, pasture, fallow.

In addition to the comparative financial returns obtained from the various rotations, a comprehensive survey will be made each year to determine the incidence of foot-rots, take-all, flag smut, sand drift, or any other factors which may be influenced by any particular rotation.

The paddock was cleared in 1932, sown to Ranee 4H wheat in 1933, oats 1934, and fallowed in 1935. Prior to clearing, opportunity

Two-course rotations under trial at Walpeup.

was taken to carry out an exact survey of the timber and vegetation. A chemical soil survey of the area has also been made. In order to test the uniformity of the soil, the bulk wheat crop, in 1933, was cut into numerous blocks and harvested as a uniformity trial. In 1936 opportunity was again taken to test the natural variation of the soil, the sites of the permanent experiments being laid out in plots of similar size, and all being sown to wheat under the same conditions. This work involved the sowing and harvesting of some 234 plots.

The crop rotations were commenced in 1937, and it is expected that some years will elapse before the effects of the different rotations on soil fertility become apparent.

OATS.

Oats occupy a larger area than is generally recognized, the average area sown in the Mallee over the last ten years being more than 400,000 acres, compared with approximately 1,500,000 acres of wheat.

Oats may be cut for hay, stripped for grain, or fed off to stock. The proportion of the oat crop used for each of the above purposes varies according to seasonal conditions. Oats as hay or grain form the most suitable fodder reserve for Mallee farmers. During the past ten years, increasing areas of oats have been sown with the object of providing feed for sheep during the winter and early spring months.

Oat Variety Trials.

Six named varieties of oats have been tested for eight years, the three types, classified according to the order in which they mature, being:—

Early maturing	..	Mulga, Gidgee.
Mid-season	..	Guyra, Dawn.
Late ..	..	Lachlan, Algerian.

In addition to the above varieties, other varieties have been tested for a shorter period. The varieties now being tested are those named above, together with the following:—Early Kherson, Fulghum, Algeribee, and three Palestine—Dawn crosses, R4–1–1, R46–2–1, and W8103. The variety, Lachlan, has now been omitted from the test.

In those years in which late rains are not experienced, the early maturing varieties can be expected to give better yields than the latest maturing variey Algerian. Over the last seven-year period best results have been obtained from Dawn, Guyra, Mulga, and Gidgee.

There is little doubt that the earlier maturing features of these varieties warrant the adoption of at least one of them on a considerable portion of the area sown to oats in the central and northern Mallee.

The results of the main oat variety trials at the Station during the past eight years are tabulated below. In these experiments, the crops were not grazed by sheep at any stage. In all years these trials have been sown between mid-April and mid-May, regardless of soil conditions.

Unfortunately, the grain tests were ruined by high winds during the 1932 and 1933 seasons, and many of the plots lodged and shed badly, so making the tests unreliable, and the results were discarded.

Stacking Hay at Walpeup.

[Continued on page 552.

Fodder Conservation

Pyramid Hill Competition

Report of the Judge, A. Morgan, B.Agr.Sc., Irrigation Field Officer

CONSIDERABLE disappointment was experienced with the type of fodder which formed the bulk of the the reserves exhibited by entrants in the Pyramid Hill District Fodder Conservation Competition this year.

Oaten hay overshadowed in frequency and quantity all other types of feed stored for winter and emergency use, and this seems anomalous in a district where irrigation supplies are available.

However, it would be unwise to assume, following an inspection of stacks on half a dozen properties, that the whole district is averse to the promotion of a fuller use of its water supply through the medium of permanent crops of proved worth, such as subterranean clover and lucerne. On all the farms visited, subterranean clover had been established in one or two small paddocks, but its progress in acreage has been much slower than would be expected in view of the esteem in which it is held wherever it has been given fair trial.

When making a criticism of this nature, one must remain alive to the fact that the average irrigator is necessarily a keen student of the economics of his profession, and it is to this interest that arguments for alteration of existing practices must be directed. The question to which the agrostologist must find a satisfactory answer is to what extent and in what direction the irrigator in the Pyramid Hill District will benefit by sowing lucerne and subterranean clover, and conserving surplus production from these crops as hay, instead of continuing to grow cereals as the main standby for winter and drought feeding.

Factors which are important in the economics of fodder conservation are adaptability of the crops to both grazing and haymaking, costs of production, ease in handling, feeding values, and ease of protection of the stored feed. Let us apply these criteria to the permanent crops quoted.

The combination of paddocks of subterranean clover and lucerne is obviously a desirable one as far as continuity of grazing

Stacks on Mr. J. A. Broad's property.

is concerned. In most years subterranean clover can be started by watering before the end of March if sufficient rain has not been recorded; it is capable of good carrying from May onward, and can be kept green to the end of November if the mid-season Mount Barker strain is used. The late strain—Tallarook—which a number of Pyramid Hill irrigators saw under irrigation conditions at Mr. Head's property at Shepparton last February, when the seed was being harvested, can be made to carry on a fortnight or so later than the Mount Barker. They will also remember that some paddocks on the property had been watered up in mid-February and the seedlings were thriving. Lucerne can fill the breach from October-November to March, and a continuity of feed of high quality is thus maintained by the alternation of summer and winter permanent crops. Permanent pasture, with white clover or strawberry clover as the principal legume, and perennial rye grass, cocksfoot, paspalum, or Phalaris tuberosa as the dominant grass, is not favoured as strongly at Pyramid Hill as lucerne, because of the difficulty of obtaining water at a frequency which will give it conditions for best development.

What are the extra costs involved in growing these crops, as compared with the costs of cereal growing? The only important extras are

the preparation of the ground for correct watering and the cost of the seed. In fact, with subterranean clover, which can be established with a crop of oats or barley for less than 2s. per acre for extra seed, the extra cost can be limited to the grading and banking of the paddock. In this respect the farms visited were particularly favourable for the institution of good lay-out for irrigation, but the attempts made to secure such a lay-out were not impressive. Where the land is practically graded by nature, one would expect that man would be willing to add the final touches, but such was not the case. Excessively long wide bays were favoured. Apart from water-savings it is plain that the costs of grading and banking are not large and are no bar to progress. With lucerne, the cost of seed is a more important consideration, but against the expenditure of £1 or so per acre, must be offset the longevity of the crop.

Both subterranean clover and lucerne are well-adapted for hay-making, giving products of surpassing nutritive value and palatability when handled under normal conditions.

Conceptions of what constitutes reasonable treatment for these crops differ, and the results obtained from them vary from excellent to indifferent, according to how closely the treatment given approximates to the correct husbandry, as determined by experience and research.

Superphosphate is undoubtedly a first requirement for success. Subterranean clover has been established and maintained under irrigation with a low rate of manuring, but the results obtained make a poor showing against paddocks regularly top-dressed with a bag of super. to the acre. It is significant that where any topdressing was being done on the properties inspected, the subterranean clover paddocks had first call on the manure.

The quantity used in such top-dressing now needs more attention. The conclusion reached from numerous and prolonged tests is that an annual dressing of 2 cwt. per acre is the lowest that can be considered adequate. Subterranean clover paddocks which have had regular top-dressing at this rate for four or five years have reached an average carrying capacity of five or more sheep to the acre. This expectation is more likely to be realized where some form of controlled grazing is adopted as routine. Grazing one week out of four is sound practice, and under this system subdivision is necessary.

An illustration of the productivity of subterranean clover under this system, was given by Mr. G. R. Morton, at a field-day, held in October, 1939, at Benjeroop. A paddock of 15 acres, with bays 17 chains long, was sown in 1933 with barley and a mixture of 2 lb. subterranean clover and 3 lb. Wimmera rye grass per acre. In 1936, a new channel and fence were put in, giving runs of 8½ chains in two paddocks of 7½ acres. In 1939, the late February rain of 2½ inches brought up the clover, and the first watering was given on 10th March. On 17th March, it was top-dressed with a bag to the acre. The first grazing was with 50 sheep for three days, on the 7½ acres. On 2nd April, 450 sheep were put in for another three days. The second watering was given on 6th April, and on 11th May, 240 sheep were put in for five days. 490 sheep were put in for four days on 23rd May, 410 for five days on 12th June, and 260 for a week on 12th July. Beginning on 14th August, 430 ewes with 155 lambs were grazed for three days and 600 ewes with 450 lambs were on it for three days from 20th September. By 18th October, a wonderful growth of clover and grass was again evident.

When rested about three months, and mowed, yields of 2 tons per acre of this clover are not extraordinary. This compares favourably with the yield of the average oaten hay crop. Handling charges are higher, but this disadvantage is offset by the fact that there is no recurring charge for ploughing, cultivation, seed, twine, and protection from mice. Baling introduces greater ease in storage and protection from weather, and facilitates feeding out, but is in no way essential. As to quality, the following analyses made from Victorian

Opening pit silage at Mr. J. Woods's farm, Pyramid Hill.

material by the Agricultural Research Chemist (Mr. W. R. Jewell) and quoted in the Department's free leaflet "Foods and Feeding," by Mr. A. C. T. Hewitt (Live Stock Research Officer), provide a fair comparison which shows the merit of pasture hay.

AVERAGE COMPOSITION.

Hays.	Moisture.	Dry Matter.	Ash.	Crude Protein.	Carbohydrate.		Crude Fat.
					Fibre.	Soluble.	
	%	%	%	%	%	%	%
Mixed grass and clover	14·5	85·5	7·1	6·1	26·4	44·1	1·8
Oaten ..	12·6	87·4	5·8	4·9	23·5	50·7	2·5

Lucerne.

Lucerne has critics in the district. The soil is stated to be unsuitable. Admittedly the plain ground unaided will not give the luxuriance of growth per watering which can be obtained on timber country or on silty (Mallee) soil. It is also true that the water absorbed on plain land is probably about 2½ inches, as compared with 4½ inches and more on the other soil types. By the use of superphosphate and by sound watering methods, however, good yields of lucerne hay are being obtained on soils no better than those in the Pyramid district. Werribee settlement, before permanent pasture ousted lucerne, provided an instance of successful lucerne hay production on soil of a strong clay-content and not very permeable to irrigation water (the absorption of 2½ inches on graded land was an average watering).

For hay, lucerne offers advantages over subterranean clover in that the weather factor is more reliable for summer work than for spring operations. The second and succeeding cuts of lucerne, except where the checkbanks are too big and grow a variety of weeds, and weedy grasses, can be relied on to be clean for six or seven years while the stand is still in its full vigor. It would not be fair to say that lucerne hay is greatly superior to first-class subterranean-clover hay as a fodder reserve, but it is a more concentrated fodder, if clean, than the usual subterranean clover hay with its content of weedy annual grasses, most of them in an advanced seeding stage. Summer forages such as millet, and members of the sorghum family, while bulky, are not permanent, not easy to handle, and their use is preferably restricted to preliminary crops before lucerne and pasture.

Fodder reserves and storage sheds at Mr. J. A. Broad's farm. Lucerne in foreground.

The importance of grading has been touched on, but there is another aspect of good lay-out which appears to be as important as the saving of water and labour in irrigating. This is the promotion of confidence in the use of water early and late in the watering season, thereby extending the usefulness of permanent crops, particularly the subterranean clover. Good lay-out is essentially the easiest means of getting uniform coverage and absorption of water, and also of getting any excess water away quickly. Excess water is equally undesirable summer or winter, and its bad effect is so patent on ungraded land that we find irrigators who have not paid attention to grading and banking, preferring to let paddocks suffer from drought rather than use the water and risk scalding in spring and waterlogging in autumn.

The Awards.

The winner of the competition was Mr. J. A. Broad. His property totals 447 acres, of which 26 acres is sown down with lucerne, and nearly 70 acres with subterranean clover. The remainder is natural pasture, some part of which is broken up each year for hay growing. On the subterranean clover paddocks top-dressing is at the rate of 140 lb. per acre, but no manure is applied to natural pastures.

Stock carried at the time of judging included 350 ewes just lambing, five Border Leicester rams, eight milking cows, and nineteen yearling and two-year-old cattle, including two young Jersey bulls. Eight horses and two ponies are shared between three brothers. According to the schedule, this stocking represents 68 stock units.

A total of 118 fodder units was made up from three large stacks of oaten hay, one small stack of barley and rye hay, one stack of grass and clover hay, about 2½ tons of chaffed natural pasture hay, and a small stack of barley. These various fodders, which are all fixed at 1½ tons per fodder unit, were estimated to total 176 tons.

The stacks were grouped about a galvanized-iron milking-shed, and timbers were erected for a large iron shed for storage of chaff. Mr. Broad's design is to chaff the hay direct from the stacks, using a portable plant, and to use a blower to fill the shed.

Mouse-proofing is to be secured by carrying the iron walls well down into the ground. The stacks were fenced off to give protection from stock, but a number of openings had been left and improvement could have been effected here. Ringlock fencing without posts was used to protect a small stack of barley from pigs, and a bag tarpaulin kept out the rain. Other stacks were unprotected by thatch or coverings. Wind protection was provided by the usual wires passed over the ridge and weighted by posts and logs. Although cheap, and effective enough against wind, this method tends to increase damage from rain, and is not recommended for fodder likely to be kept over more than one winter.

Grass hay, estimated at 19½ tons, was intended as a permanent reserve, not being subject to damage by mice. In the event of the autumn continuing dry, Mr. Broad intended to bag oaten chaff from the shed and put it out for the ewes and lambs, in self-feeders. The design of the chaff-shed inspected could have been improved, it is thought, by using a small inside porch and double doors. The shed can then be filled to capacity, and yet the owner can always get inside at ground level to fill bags of chaff.

Quality of the hay was average, the main defect being coarseness. The grass hay showed a good colour and aroma, but it was also rather coarse. All stacks were well built, but no dunnage or old hay foundations had been provided.

Pastures showed little in reserve for the winter, a state of affairs for which the adverse autumn must be blamed. Lucerne had been fed off, and lambs taken off it a month before had averaged 27s. 6d. A four-year-old subterranean-clover paddock had been given its first watering in the middle of March, and the superior growth on some portions which had received a second watering showed that lack of rainfall and irrigation had held up the growth. Grading had not preceded establishment in this field, and swampy areas with little or no subterranean clover were in evidence. In regard to production of the cows, no records were available, but Mr. Broad planned to commence herd-testing on 1st July.

One of Mr. J. A. Broad's best cows.

Second place was secured by Mr. A. Aicken, Central Mologa. His property covers 315 acres, and includes 26 acres of subterranean clover, 36 acres of Wimmera rye grass, and 48 acres of stubble intended for sowing with subterranean clover. The water-right is 35 acre-feet. Top-dressing has been limited to the subterranean clover, which receives one bag per acre each year.

Stock carried consisted of sixteen cows, two heifers, five yearlings, and one bull. Two horses and 99 ewes completed the list, and the total stock units were therefore calculated at 39. Fodder reserves, mainly oaten hay, were calculated as 69 units for a total of nearly 100 tons of hay and grain.

A most attractive feature of this exhibit was the protection afforded by skilful thatching of the hay-stacks and shed. In comparison with Mr. Aicken's stacks, although one showed a lean at one end, others, which were equally well built, suffered in appearance. Protection from stock was provided by a fence with four barbed and a middle plain wire, the entrance being a mallee gate. The site was on high ground, and adequately protected from irrigation water. Fire protection was ensured by the absence of rubbush in and around the stack-yard, and possible sources of sparks were situated at a safe distance.

Quality of the hay was good except for dullness, and odd plants of the poisonous rye grass, "darnel" or "drake" (*Lolium temulentum*), and of wheat.

It is intended to chaff the stacks, when required, by contract, and store in a thatched iron-walled shed near the house and dairy buildings. New thatch covered the original straw roof, and protection from sparrows and other birds provided by bagging along the eaves. Seven tons of bagged chaff was stored in the shed, also 33 bags of barley. Feeding out was done in the yards.

Third place was gained by Mr. J. F. Woods. It is not intended to give a full description of his exhibit, but as he was the only entrant possessing silage, which has proved particularly valuable for his cows during the past dry winter, this method of conservation is worthy of comment. On various properties in the Pyramid Hill and Kerang districts both the pit and the stack methods of making silage were tried out in the spring of last year, when growth was luxuriant, and a variety of fodders which reached different stages of fermentation all gave products relished by stock when green feed is scarce. Mr. Wood fed his silage out to cows, but on other properties ewes and lambs soon became educated to it and benefited from it. It is difficult to say which method—stack or pit—is to be preferred. A test carried out at Meering West with the co-operation of Mr. H. Lester Smith and Sons showed that, even with unpromising material with 83.5 per cent. moisture content, both methods produced silage acceptable to ewes and lambs. On the average irrigation property the choice of a site is usually limited, through considerations of cartage, to a dry corner of the paddock in which the surplus feed is growing. With a pit under these conditions drainage of the liquor from the ensilage may be poor. With the stack silage drainage presents no problem, but topping the stack with soil and sandbags involves more labour than covering a pit. In feeding out, stack silage is easier to handle. The question of which method to employ is therefore more one of labour and convenience than of quality of the product. The important point is that it pays to have silage of one type or another as a fodder reserve.

Details of the awards are shown in the accompanying table:—

Points Allotted.

Exhibitor.	Suitability (30).	Quality (35).	Location (10).	Protection (20).	Economy of production (20).	Crop and pasture growth (10).	Fodder in relation to requirements (40).	Excess fodder (35).	Total (200).
J. A. Broad ..	23	31½	9½	15*	14	7½	40	35	175½
A. Aicken ..	20	34	8	17	14	6	40	27	166
J. Woods ..	33	31½	8	15	17	7	34	..	145½
W. W. Pearse ..	20	31½	8½	15	14	6	31	..	126
M. Cassidy ..	20	28	6	12	14	8	16	..	104

* Full protection being arranged for (see text) but not in operation at time of judging.

Swine Plague Prosecutions

At the Kerang Court of Petty Sessions on 18th September last, Messer Bros., and F. R. Chick, were charged with having exposed for sale pigs infected with swine plague. A fine of £1, with £1 7s. 6d. costs, was imposed in each case. William Joseph Ridgway, stock inspector, gave evidence that the pigs were offered for sale at the Kerang sale yards in a diseased condition.

The defendants denied knowledge that the pigs had swine plague, and stated that they were not aware the animals were sick.

Mr. Duggan, P.M., in recording convictions, pointed out that the maximum fine for the offence was £100, which indicated how seriously the offence was regarded by the legislature. However, as they were the first cases of their kind in the Kerang district, and the defendants were not aware of their seriousness—although they ought to have been—they would be fined £1 each.

Hoven or Bloat in Cattle

By A. R. Grayson, B.V.Sc., Veterinary Officer

PROBLEMS confronting the primary producer are not necessarily confined to periods of drought, or, for that matter, to any particular season of the year. In fact, quite frequently, when conditions to the casual observer appear to be favourable, the farmer is called upon to exercise just as high a degree of good management as under drought or other difficult conditions.

For example, in a good season, there is a constant danger of hoven or bloat occurring in stock. This condition may be defined as a distension of the rumen or paunch, caused by gases created by fermentation of the contents of that portion of the stomach.

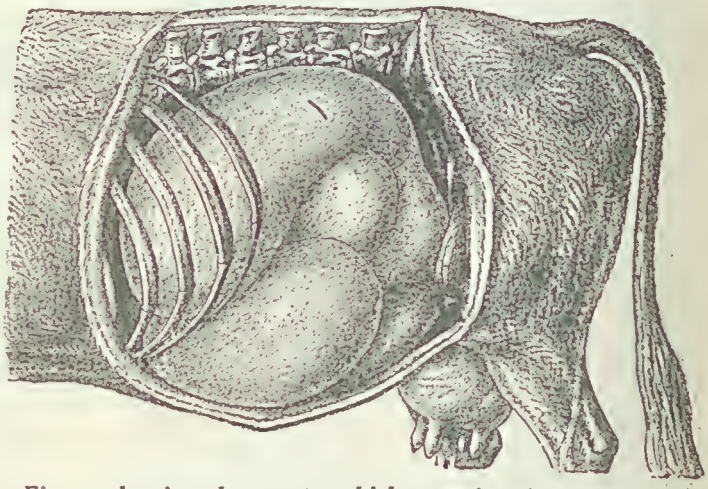


Figure showing the rumen which occupies the left side of the abdominal cavity.

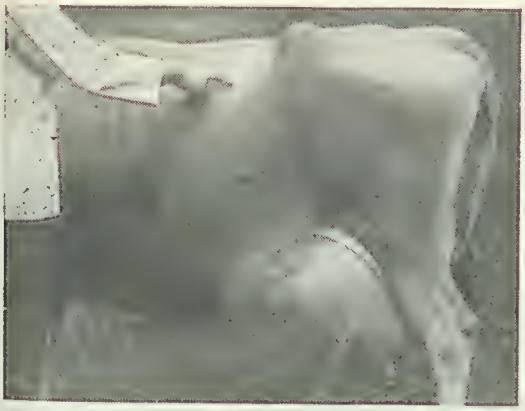
Various causes may be responsible for bloat, but by far the commonest in Victoria is when stock are given sudden access to young, lush and succulent pasture, with a high clover content. The danger of this practice increases when the pastures are wet, either because of rain or after a heavy dew.

Excessive quantities of other foods which ferment rapidly, such as mangels, turnips, potatoes, cabbage leaves, &c., also may cause the condition, while it is due sometimes to choking, brought about by a mass of food, such as potatoes, becoming lodged in the throat. Other sources of the trouble are an enlarged, tubercular thoracic gland, resulting in pressure on the gullet, a lack of tonicity in the muscular wall of the rumen, or defective secretions. All of these conditions are conducive to a stagnation of food in the rumen, and subsequent fermentation, which is a cause of bloating.

Cases due to these specific causes are usually single in occurrence, but when the trouble is brought on by dietetic causes, it is a common experience to discover several animals affected simultaneously. This occurs usually when cows which have been yarded for milking are put on to a rich pasture of largely a leguminous nature, while the pasture is still wet. If the animals are very hungry, they quickly fill their paunches with cold, wet and succulent herbage, without having undertaken much exercise in doing so. This quickly swallowed mass of food chills the walls of the rumen, rendering it passive and incapable of functioning correctly, with the result that fermentation may rapidly occur.

The onset of symptoms is very sudden, and frequently, animals on pasture continue to graze until signs of discomfort, or actual pain, are evident. The abdomen becomes distended, and the consequent pain is evidenced by paddling movements of the hind legs, frequent looking at the sides, spasmodic twitching of the tail, and kicking forward at the abdomen. The head is extended, the nostrils dilated, while the mouth may be open, and the tongue extended. Irregularities in respiration are, first a blowing from the nostrils, soon followed by accelerated, shallow, laboured breathing, due to the great pressure of the distended rumen on the diaphragm.

The upper left side of the abdomen becomes increasingly distended, and when tapped with the hand is found to be resonant and drum-like. Resonance is increased in proportion to the amount of free gas present. However, when the gas is intermixed with the food, and the contents of the distended rumen consist of a bubbly, yeasty, effervescent mass, the resonant sound on percussion is not so evident.



The finger points to the correct site for the introduction of the trocar and cannula.

As the bloating becomes more pronounced the animal shows increasing signs of pain. Grunting and moaning become more evident, and the pulse weak, and later, almost imperceptible. The visible mucous membranes become bluish or cyanotic, and in some cases belching or actual vomiting occurs. When the patient reaches this stage, it soon dies from asphyxiation if relief is not given.

Bloat, although very serious in cattle, is perhaps more dangerous in sheep, and almost invariably follows sheep becoming "cast".

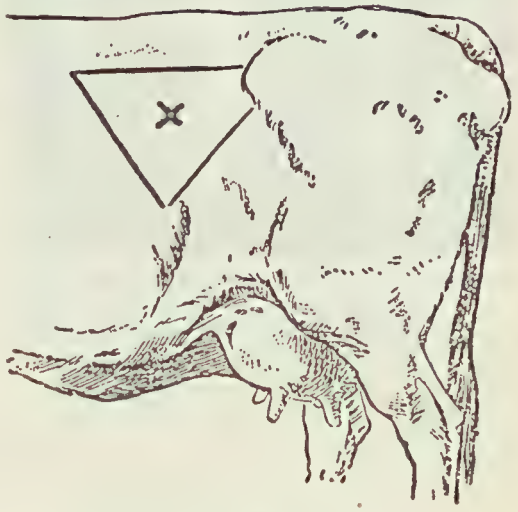
Removal of the gases from the rumen is the primary object of treatment. When bloating has just started, the patient should be forcibly exercised, and the distended abdomen massaged or kneaded with the clenched fist to bring about belching of the gases from the stomach. This process may be assisted by placing a wooden gag in, and across the mouth, securing it in position by tying to the horn on each side. If the state of patient permits, the stomach tube may be inserted and may bring relief. If this is successful, the tube may then be used to administer medicines. If however, the animal is very restless or distressed the passage of the stomach tube is not an easy matter, and is not recommended. In such cases, and indeed in all advanced cases, the easiest and most effective way of withdrawing the gas is to puncture the rumen by means of the trocar and cannula. The cannula is a hollow metal tube, surmounted by a circular guard or shield. In some instruments the tube extends above the shield, so that a rubber tube may be attached for the introduction of drugs or medicines directly into the rumen. The trocar is a solid metal instrument which fits closely into the cannula. It has a round or oval handle, and is sharply pointed at the other end, the point extending beyond the cannula. The type of cannula most suitable for relieving the pressure of gas in the abdomen is that with a diameter of from ¼ to ½ inch, and a length of from 8 to 10 inches.

If the animal is not *in extremis* the hair should be clipped over the highest point of the distended left flank, which is usually about the middle of the triangle formed by the last rib, the transverse processes of the lumber vertebrae, and the external angle of the haunch. (See Figure below.)

A disinfectant, such as tincture of iodine, should be applied to the skin, which is then incised with a knife. The trocar and cannula may be then inserted in a downward and forward direction with sufficient force to penetrate at one operation the abdominal wall, and the wall of the rumen. The cannula is then held in position, while the trocar is withdrawn, permitting the escape of the gases through the hollow instrument. When much free gas is present, its escape from the stomach is very pronounced, but when the contents of the stomach are mixed with the gases the escape of gas is not so marked.

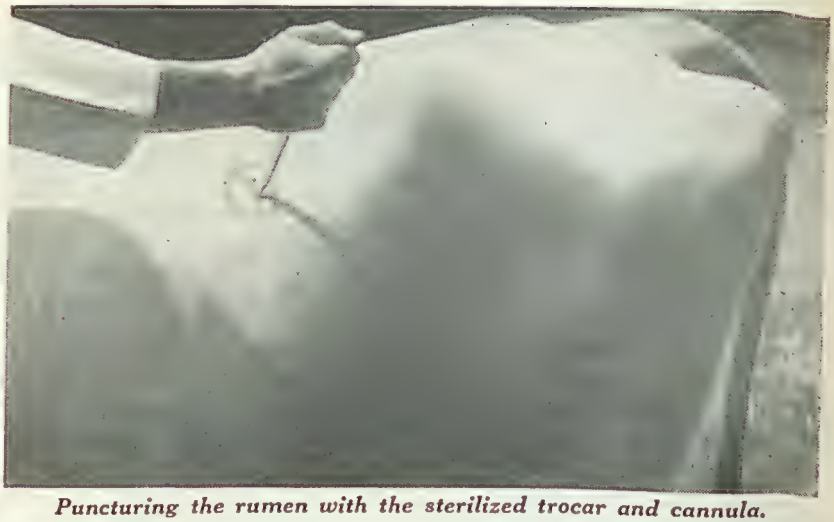
If gas escapes freely, steady pressure should be exerted on the cannula, more especially if it is a short instrument, as the emptying stomach quickly regains its muscular tone, and begins to contract, tilting the cannula to such an extent that it may lose connection, and render a second puncture necessary.

After the escape of the stomach gases, medicines may be poured through the cannula by attaching a rubber tube and the use of a funnel directly into the rumen, if considered necessary.



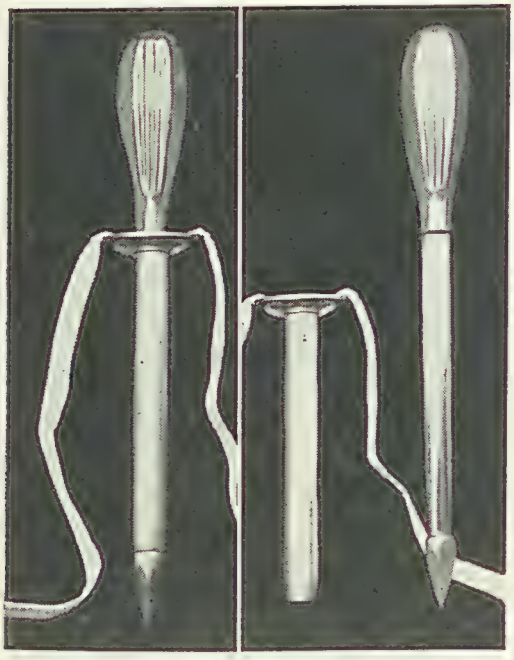
The site of the operation.

To prevent any possible infection of the wound, the trocar should be re-inserted into the cannula before that instrument is withdrawn, to remove any food or other foreign matter that may have passed into it. The instruments should be kept sterilized so that they are ready for immediate use.



Puncturing the rumen with the sterilized trocar and cannula.

Less extreme cases may be treated by medicine administered for the purpose of removing gas already formed, and reducing fermentation. Various remedies are in almost daily use for the treatment of earlier, milder cases. Bi-carbonate of soda with ginger, Stockholm tar, &c., have all been used with some success, but perhaps better results would be obtained from the use of sodium hyposulphite, at the rate of 2 to 5 oz. in one pint of water, or two drams formalin in one pint of water, or a mixture of 2 oz. pure turpentine, with 15 to 20 drops of oil of peppermint in one pint of raw linseed oil. Whatever treatment is used, it should be followed by administering a stimulant such as carbonate of ammonia 1 oz. and nux vomica 1 dram, repeated in four hours.



Left, the trocar and cannula as inserted; centre, the cannula with tape for tying round the barrel of the animal, and right, the trocar.

It should be borne in mind however, that wise supervision and management can to a very large extent minimize the losses, and the consequent expense caused by bloat in cattle. The dangerous cases met with when stock are grazed on rich clover and lucerne pastures indicate clearly the necessity for precautionary measures. Stock should not be put on to these growing, lush pastures while hungry, or in the early morning, when the pastures are cold and soaked with moisture. For the first few days they should be kept under observation, even if allowed on the pastures for short periods only. The risk is further minimized if the stock are fed prior to being put out to graze. For this feeding, chaff or meadow hay is satisfactory. Longer grazing periods may be allowed as the animals become accustomed to the pasture.

The two main precautionary measures therefore, are (1) not to graze stock on growing clover pastures which are wet and cold, and (2) feed cattle as prescribed previously, before allowing them to graze.

Live Stock Notes

Reminders for November—December

Compiled by A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

Farmyard Manure and Soil Fertility.

THE real value of farmyard manure is not yet fully appreciated in this country, and tremendous quantities are allowed to accumulate and waste around buildings and yards, where it cannot benefit crops and pastures. The urine, a very valuable liquid manure, is allowed, as a rule, to run to waste down a drain.

The manure and urine dropped on the pastures and crop paddocks are utilized, but it is frequently stated by farmers that it does not pay to collect and spread the manure dropped round buildings and yards. It is difficult to understand why farmers who appreciate the value of artificial fertilizers are not fully aware of the worth of farmyard manure, which is regarded by some as a liability rather than an asset, not worth the effort of removal from around farm buildings and other places where animals congregate on to land that would benefit greatly by its dispersion. For their growth, development, and production animals require certain quantities of various materials, including minerals. A continuous flow of these materials through the animals is necessary to their bodily health. After use the greater part is excreted in the manure and urine. They are then passed back to the soil, re-used by plants, and again converted into animal food.

Usually, on farms where concentrates are purchased for stock feeding, much larger quantities of such essential elements as phosphorus, nitrogen, and potash are added to the soil than are removed from the farm in the meat, eggs, butter, wool, hides, or other products. Lime, on the other hand, is removed in larger quantities by animals than by plant products such as grain, but it is cheaply replaced by ground limestone, calcium carbonate, or slaked lime.

In countries such as England, where tremendous quantities of rich stock foods have been imported, especially since the 1914-18 war, the fertility of the soil has been greatly improved, and, now that crop farming has been reverted to, excellent yields may be expected for several years. In this country the greater demand for dairy produce, eggs, pig meats, &c., caused by the present war, has given farmers an opportunity to so firmly establish live stock industries that, when the war ends, animal products, in all probability, will continue to be exported in preference to plant products.

It is estimated that the dairy cow removes over 30 lb. of calcium phosphate from the soil in secreting 10,000 lb. of milk. Such a state of affairs does exist where the whole milk is sold, but, under the usual dairying procedure, where the cream is sold and the skim milk is fed to pigs, the total loss of calcuim phosphate from the farm is only about 5 lb. for each 10,000 lb. of milk produced, provided, of course, that the farmyard manure is properly spread over the farm.

Two hundred pounds of bran or pollard and 6 lb. of ground limestone fed to the cows and pigs would make good that loss. If, on the other hand, the milk is sold, the amounts of lime and phosphoric acid leaving the farm in the whole milk can be replaced by hand-feeding 700 lb. of bran and 21 lb. of ground limestone. Seven hundred pounds of bran to a dairy cow producing 10,000 lb. of milk is very light feeding, since cows producing this amount of milk are frequently fed up to 3,000 lb. of concentrates.

On large pig and poultry farms a wonderful opportunity exists for building up the fertility of the soil, and on small holdings where the amount of manure excreted is in excess of requirements, considerable revenue should be obtainable from the sale of manure to neighbouring farmers. When fed standard rations, a bacon pig consumes about 30 lb. of calcium phosphates. After using much of this for the normal functions of the body, the pig excretes about 25 lb., mostly in the manure. Each laying hen eats about 4 lb. of calcium phosphate per year, of which about 95 per cent.

is excreted in the droppings. Similar figures apply to nitrogen and potash, although most of the nitrogen and potash is excreted in the urine, and is more likely to leach away, especially from pig sties, stables, and cow-sheds. Very few farmers yet realize the value of collecting this liquid manure.

It has been estimated that an average draught horse excretes each year 12 tons of manure, including urine. Based on present values of artificial fertilizers, this would be worth 19s. 6d. per ton, or a total of £11 14s. A dairy cow excretes annually 12 tons, worth £9 12s. at 16s. per ton; a bullock 7 tons, worth £6 16s. 6d. at 19s. 6d. per ton; a sheep 15 cwt., worth approximately £1 8s.; a bacon pig from birth to 200 lb. live weight excretes 1 ton, worth 14s., and a hen ½ cwt. per annum, worth 7½d. at 25s. per ton.

Dairy Cattle.

Seasonal conditions throughout the dairying districts are such that the industry will have difficulty in fulfilling the contracts recently made with the Government of the United Kingdom for the supply of 100,000 tons of butter, 20,000 tons of cheese, and large quantities of condensed and dried milks.

Although fluctuations in production caused by adverse seasonal conditions cannot be wholly overcome, they can be considerably reduced by good dairy husbandry, and in this respect every effort should now be made.

At the moment feed is a limiting factor to production, and, wherever possible, any surplus grass should be conserved as hay or silage. Plans should be made also for the sowing of autumn crops in late February and early March.

Farmers seeking advice on these matters should write to the Director of Agriculture, Treasury Gardens, Melbourne, C.2.

It is of the utmost importance that every endeavour be made to fulfil the existing contracts, not only to assist the Empire's war effort, but also because we must anticipate that when negotiations for new contracts are being made, consideration will be given to our efforts to uphold previous contracts.

Another factor having a direct bearing on the dairying industry is the wider use of margarine. Failure of dairy farmers to produce sufficient butter to meet this margarine competition is likely to have serious and lasting effects on butter consumption, to the detriment of the dairying industry.

Calves.

Lime water frequently is recommended for calves, especially those being fed on gruel supplements. In such cases one teacupful should be added to each calf's feed. Lime water is made by adding one double handful of lime —preferably slaked lime—to a bucketful of water. It should be stirred and the sediment then allowed to settle. After using the clear lime water at each feeding time, it should be well stirred again and left to settle before the next feeding. More water can be added when required. If kept clean it should not be necessary to mix fresh lime water more than once a fortnight.

Sheep.

The amount of fodder required for supplementary feeding depends upon the amount of paddock feed, and the length of time that feeding is necessary. A maintenance ration for a sheep is supplied by about 1½ lb. of oaten meadow or lucerne hay, 1 lb. of oats, or ¾ lb. of wheat, but it is seldom necessary to feed the full amount. One bag of oats will supply 8 oz. to 250 sheep, or 4 oz. to 500 sheep. Eight ounces daily is fairly heavy feeding when some roughage is available, 4 oz. usually being sufficient.

For dry sheep, hay and grain usually supply sufficient nutrients, but for growing sheep and lambing ewes additional protein may be necessary. This can be supplied as lucerne hay, linseed meal or nuts, or meat meal. With grain, up to one-third of the ration by weight should be lucerne hay, or one-quarter part linseed nuts, or one-tenth part meat meal. With straw, at least twice as much of the protein supplement is required.

Horses.

One blood-sucking and two biting species of lice have been causing trouble amongst horses recently. However, lice rarely are noticeable on well fed and well groomed animals. Horses badly cared for and allowed to get into low condition are the chief sufferers from these parasites. The presence of lice is indicated by the horses rubbing themselves to relieve irritation. The hair of affected animals is harsh and dry as a rule, and later falls out, leaving bare untidy patches. On closer examination the lice may be seen on the skin and coat.

The vermin breed rapidly and spread directly from one horse to another, or from infected stables, harness, &c.

If possible, affected animals should be clipped and then treated by working kerosene emulsion, sheep dip, or nicotine sulphate into the skin. The treatment should be repeated in two weeks, to destroy lice hatched from eggs not destroyed by the first application. Kerosene emulsion is made by mixing 1 lb. of soft soap in one gallon of hot water, and stirring in one pint of kerosene as it cools. Nicotine sulphate lotion is made by mixing 1 oz. of nicotine sulphate with 1 gallon of soapy water. Sheep dips are used in the same strength as for dipping sheep, but, when used, care must be taken to prevent the horses from licking the poison.—(W. D. Shew, B.V.Sc., Senior Veterinary Officer.)

Bracken Fern Poisoning.

Bracken fern poisoning has recently been rather prevalent, especially in young cattle. Where bracken fern is plentiful, underfed stock frequently consume the poisonous fern shoots to satisfy their appetites, and deaths may occur. When stock are well fed, there is no desire to eat poisonous plants. If it is not possible to keep stock away from bracken fern, they should be liberally fed.—(W. D. Shew, B.V.Sc., Senior Veterinary Officer.)

Pigs.

The new meat contract between the British Ministry of Food and the Australian Government provides for increased quantities of pig meats, and a definite quota of bacon-weight pork has been provided. This should give pig raisers confidence regarding markets for a period of one year at least.

Prices fixed under the contract are generally on the same basis as those of the last year's contract, and should mean an average of about 6½d. per pound to growers for prime pigs.

In agreeing to the contract, the British Ministry of Food made it very clear that overfat pigs are not desired, and a reduction of ¼d. per pound is provided for second grade pigs. Grading will be based largely on fatness, and excessively fat pigs will not be accepted for export. It is, therefore, most important that pig raisers should market their pigs in prime condition, that is, before they become very fat.

The Ministry also urged that every endeavour should be made to see that the quota of 24,000 tons of baconer pork is reached, and producers will realize the importance of keeping supplies up to estimates when future contracts are being discussed.

Baconer pigs are required more than porkers, and the weight ranges for baconers are 111 to 180 lbs. dressed. However, pigs should be marketed when in correct condition irrespective of their weight.

Detailed information on pig breeding for market requirements, and other aspects of pig production, is obtainable in printed form and in personal advice, obtainable from the Department of Agriculture.—(L. A. Downey, H.D.A., Pig Expert.)

Poultry.

The proper management of the laying flock is just as important as any other operation on the poultry farm.

One of the first considerations is to build up the flock with birds bred from the best laying strains, and possessing a high degree of constitutional vigour. It is infinitely better to start with a small number of the best birds than to commence with a larger flock of poorer quality stock. It is equally important that the high quality of the stock be maintained from year to year.

It should be realized that when birds are kept on the intensive system they require special care and attention in order to keep them in the best of health, and to obtain the maximum number of eggs.

The laying houses should be rain-proof, free from draughts, and properly ventilated. They also should be deep enough to allow the birds to keep away from the front of the house during bad weather and when perching at night. A concrete floor is preferable, and if this is covered with 4 to 6 inches of clean straw litter and cleaned out every three months, the general conditions will be ideal for the birds. If the litter is allowed to remain in the pens too long, it becomes contaminated with harmful organisms, and eggs of external and internal parasites. The general health of the birds will be impaired in consequence.

In many localities it is possible to build the houses facing a northerly direction. Wherever this is practicable the advantage gained is to allow the sun to reach the floor and litter during a good portion of the day.

Other important considerations are that the perches and surrounding woodwork be kept free from red mite by frequent applications of a strong disinfectant. Food hoppers, water vessels, nest boxes, and nesting material must be kept scrupulously clean.

There should be no overcrowding. Comfortable conditions can be provided by allowing 4 square feet of floor space to each bird, and also 8 inches of perch room, with perches 15 inches apart.

Fowls will not keep in good health and lay a large number of eggs if they do not obtain sufficient food, or if it is not properly balanced. A monotonous diet must be avoided. Normally the birds should receive about 2 ounces of mash and 2 ounces of grain per bird each day. Five to 6 lb. of tender green food should be provided for every 100 birds daily. Fresh, clean drinking water, shell grit, and charcoal should also be available continuously. Particular attention should be paid to these considerations if the birds are to be kept in a good healthy condition. Once they become ill through neglect, it is impossible to restore them to normal health quickly.—(H. F. Clinton, Poultry Expert.)

Bees.

The lack of sufficient rain has caused a shortage of ground flora, which, usually, is relied upon to provide the pollen necessary for breeding up large strong colonies. This shortage has created a very serious problem for bee-keepers in the western half of Victoria. Some apiarists have been fortunate in being able to move their hives to coastal and irrigation areas, where there are sufficient supplies of pollen and nectar, but further migration is not advocated on account of the danger of over-stocking. Where a pollen shortage is very acute, the colonies should not be kept together, but split up into small groups, and placed over as wide an area as possible.

Red gums should be blooming before the end of December, and will provide a welcome supply of food, while the less reliable Swamp gum and Black Box blossom should be out in February.

Much better conditions prevail in the eastern half of Victoria, where the main honey flow is expected in late December and January.

Every effort should be made to keep the bees breeding heavily to ensure ample brood in November, thus providing many bees for honey gathering a few weeks later. Normally, except in the late districts, there will be less swarming, but the hives should be carefully watched and extra supers provided where necessary, both to prevent overcrowding and for the storage of honey. Where much swarming has occurred, hives may be left without a young laying queen. If a hive is suspected of being queenless, a comb of young larvae should be introduced, or else a swarm should be united with the hive.—(J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.)

Blood and Meat Spots in Eggs

Blood and meat spots occur in eggs as laid. The amount of blood may vary from a small spot, to a diffusion of blood throughout the entire albumen. Meat spots normally are fairly small in size and are found in varying numbers in different eggs.

Both conditions are regarded as rendering an egg unfit for consumption, and eggs containing them should be discarded.

In the formation of an egg a small rupture of a blood vessel in the ovary sometimes occurs, causing blood to enter the egg contents. Usually the blood forms a small clot close to the yolk, and is known as a blood spot. If the quantity of blood is considerable it diffuses through the albumen, giving the entire egg contents a reddish tinge. Both conditions are readily detected by holding the egg before a candling light.

Meat spots are commonly explained as being small pieces of tissue torn away during the course of egg formation, and mixed with the egg contents. They appear on candling as brownish spots. Do not confuse meat spots with the chalazae. The chalazae are twisted strands of albumen which anchor the yolk in the thick albumen. They are present in every egg, but vary in size in different eggs. In candling they appear as twisted white cords.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor

THE continued dry weather has focused considerable attention on the irrigation of orchards. It is desirable that orchards be watered as uniformly as possible both as regards lateral spread and downward penetration. This uniformity can be achieved only by the adoption of practices depending on the physical nature of the soil, and particularly on its variability in profile. To obtain uniform watering, many growers are adopting multiple furrow systems and are achieving very good results. Downward pentration is more difficult to achieve in many soils because there is a tendency for "headlands" and "footlands" to be overwatered. To some extent this variable penetration can be overcome by reducing the length of the irrigation run and modifying the head of water used. The use of the soil auger after an irrigation has been completed is advised on all soils where difficulty is experienced in obtaining a uniform irrigation. A three or four inch post-hole borer can be used quite successfully in examining water penetration down to a depth of three or four feet. If the holes are protected on the surface, they can be used subsequently for the examination of the height of the water table in orchards where this condition has given trouble in the past.

This season, codling moth has made a very early attack, and the numbers already caught in lures indicate that the season may be a difficult one. A more general adoption of supplementary measures for the control of this pest has been noticed this season, and growers are hoping to reduce the cost of spray application by more attention to orchard hygiene. In the Goulburn Valley, large numbers of pear trees have already been banded with hessian bands, and in the apple districts growers are adopting the chemical bands wherever codling moth has been difficult to control. Banding can be effective, however, only where all other forms of cover for the codling moth larvae have been removed. The scraping of loose bark from the trees, the removal of debris from the fork and around the base of the tree, the cleaning of props and the filling up of cracks and crevices are all factors which materially assist in control. Bands should be placed in position about the middle of November.

Canning peaches should be sprayed towards the end of November with a dry-mix lime sulphur spray, for the control of brown rot. The ingredients of the spray are 16 lb. of sulphur, 8 lb. of freshly slaked lime, and 1 lb. of casein spreader, to be mixed while dry and used at the rate of 25 lb. per 100 gallons. In applying the spray, growers should be certain that the agitation in the spray vat is efficient, otherwise quite an appreciable amount of the ingredients will be left in the bottom of the vat. For dessert peaches, a wettable sulphur used at the rate of 4 lb. per 100 gallons can be applied at the end of this month.

The dry weather will favour the development of red spider and growers are urged to watch for the appearance of this pest and to apply early control measures before it becomes serious in the orchard. The addition of one gallon of white oil emulsion to the arsenate of lead spray will assist in the control, but, if the pest becomes serious, it would be advisable to add a pint of nicotine sulphate. Direct the spray particularly to the underside of the leaves in order to obtain the maximum effect.

Garden Notes

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

SUMMER Annuals should be planted out not later than the end of this month if they are to be given a reasonable chance of becoming established before the arrival of the hot weather. Petunia, zinnia, aster, marigold, sunflower, celosia, clarkia, cosmos, salvia bonfire, sweet william, nicotiana, and Phlox Drummondi may now be planted. The seed of Phlox Drummondi should be sown where the plants are to be grown, as they do better in this way than when transplanted.

Prepare the ground for the main planting of gladiolus and dahlia next month.

Salvia are very useful plants to grow in the garden, and although the bonfire type may not be very good for indoor decoration, they remain in flower in the garden from early summer until the frost destroys them. With a little shelter, they may survive the winter and be treated as biennials. As the seeds will not germinate below a temperature of about 70° C, it is necessary to sow them under glass

in order to have them ready for transplanting early this month. The two popular varieties treated as annuals are:—

1. *Bonfire Salvia.*—This variety should be grown in an open position, either as a long border or massed in a bed raised in the centre. The raised bed appears to give it a more decorative effect. It requires a rich soil, and a liberal supply of water during the summer months, but it is a hardy summer plant and does well under ordinary garden conditions. For early plants, cuttings may be taken from the old plants at the end of the autumn. They strike easily and should be potted on and kept under cover until required for planting out.

Bonfire salvia has scarlet flowers, grows to a height of about 2 ft. 6 in., and is the old popular type. Harbinger is a dwarf type of bonfire, growing to a height of 15 in. and producing bright scarlet flowers. Rocket is a dwarf and not such a vivid colour. Several sports have been obtained from the bonfire type, including white and shades of pinks. Most of the pinks fade as the season progresses, and although they look very decorative early in the season, the later effect is not so good. No doubt a good pink will be developed in the near future.

2. *Salvia farinacea* is a lavender blue which makes a very good bedding plant when grown with other suitable plants. It reaches a height of from 2 ft. 6 in. to 3 ft. and lasts until the frosts. *Salvia patens* is a tuberous rooted perennial type which dies down each winter. It may be grown from seed or from division of the tubers in the early spring. The flowers are a beautiful blue colour, but unfortunately, they do not last long. It does best in the higher altitudes with a good rainfall.

Vegetables.

Further sowings of French and climbing beans, peas, red beet, carrots, parsnips, turnips, cucumbers, vegetable marrows, melons, and pumpkins may be made this month. Plant out tomatoes, lettuce, celery, and cabbages. The soil around the growing plants should be kept well hoed and not allowed to become dry. If necessary, an application of manure should be given. For quick leafy growth, a dressing of nitrogenous manure, such as sulphate of ammonia or nitrate of soda is helpful. For lettuce, nitrate of soda is very good, but for cabbages and such slow growing plants, use sulphate of ammonia. With the fruiting or seeding vegetables such as beans or peas, superphosphate is, generally speaking, the most beneficial. The fertilizer may be applied at the rate of 1½ oz. to 2 oz. per square yard.

Of the summer salad crops, lettuce is the most useful. It is an easy plant to grow, but requires a rich, friable, well-drained soil. In the summer a little shade and liberal watering are necessary. The soil should be well prepared and a good supply of farmyard manure worked into it. To ensure crispness and a good flavour lettuce require to be forced in their growth. If checked, they become tough and inclined to be bitter. When well established, a light dressing of nitrate of soda quickens the growth. The leaves may be used during any stage of their development.

In the cooler months, plant lettuce in an open position, but in midsummer a little shade is beneficial. The seed may be sown in seed beds and transplanted, or in rows where the plants are to be grown, and then thinned out. The thinned out plants can be used for further plantings. They should be placed from 5 in. to 6 in. apart in the row, with a convenient distance between the rows according to the method by which the ground is going to be cultivated. When about half grown, every second plant should be removed to give more room for development. The removed plant may be used for culinary purposes.

The cabbage-hearted and the Cos are the two main types of lettuce. The former, as its name indicates, has a centre of compact leaves, while the latter is a loose leaf type. The cabbage-hearted varieties are the most popular. There are several varieties of the cabbage type, including small winter ones, such as Mignonette and Pigmy. The brownish leaves of the Mignonette variety are not popular, but nevertheless this is a useful, hardy winter type. New York, Webb's Wonderful, Neapolitan and Feltham King are very good mid-season varieties. They heart up well, retain their crispness and are bright green in colour. Imperial is a large-hearted strain of the New York type, and is to be recommended for summer use. Iceberg is a good all the year type, but the tips are inclined to be purplish which reduces its popularity.

Paris White is the most popular of the Cos varieties. The leaves are large, but no heart is formed and for blanching purposes the leaves are tied loosely together. The flavour is quite good.

GRADE HERD TEST.—(continued from page 516).

TWELVE LEADING TWO-YEAR-OLDS.

Owner.	Association.	Name of Cow.	Milk.	Test.	Butter-fat.
			lb.		lb.
J. D. Myers	Bacchus Marsh	Sylvia	9,788	5·52	546
H. H. Wallace	Swanpool	Powder Puff	9,812	5·37	526
H. Jackson	Rochester No. 2	Koala	8,742	5·98	523
A. Krepp	Mortlake	Lady	9,183	5·60	518
J. A. Newton	Myrtleford–Whorouly	Millie	13,854	3·90	514
H. H. Wallace	Swanpool	Crystal	8,104	6·16	501
W. Collier	Loch	Daphne	8,968	5·50	493
E. J. Bingham	Warragul No. 2	Nobbie	8,988	5·46	491
Eveson and Batema	Warragul No. 1	Magpie	7,819	6·22	487
C. Ingram	Leongatha No. 2	Bonny	7,932	6·07	481
W. Harris	Dumbalk North	Selma	7,983	6·03	481
D. McDonald	Kerang	Lovely	8,583	5·40	467

Mortlake, an area not noted for high individual yields, which gives added merit to her performance.

Mr. J. A. Newton's grade Friesian "Millie" has given the unusual yield of 13,854 lb. milk as a Senior two-year-old.

The remaining heifers are all from Gippsland. Their high average test is sufficient evidence of the influence of sires of Channel Island breeding, but their good yields indicate the cumulative effect of good breeding, good management and, above all, the remarkable influence of ample supplies of rich feeding during the pre-calving period, and also during the major part of the lactation as was the case during the year covered by this report.

The Year's Work.

A perusal of the year's activities reveals that there were unusually good yields in almost every area of the State, which is the more remarkable when it is realized that the period under review occurred between the 1938 drought, and that of the present year.

An unusually difficult feature of herd-testing work which developed since the war began has been the continuous drift of herd testers to the various war services. In spite of every effort to supply certificated testers, some units have been forced to suspend operations until a continuous service can definitely be assured. In some instances the secretary and tester have enlisted and much difficulty has been experienced in finalizing the year's work. Because it was feared that the outstanding reports might be long delayed, it was decided to make the Annual Report on the 77,217 cow records now to hand. The present set-back is to be regretted,

These twelve members of Mr. H. Jackson's leading herd averaged over 500 lb. butter-fat.

for the prospects of regaining the ground lost during the depression years were much improved. Once only during the past six years, had there been more cows tested than were handled last year.

High Butter-fat Average.

The 261 lb. butter-fat average for 77,217 cows is fourteen pounds higher than the 247 lb. record of 1932. This fine average yield can be better appreciated when it is remembered that 23 of the 446 herds of more than 50 cows were in excess of 100 cows. These herds are quite generally fed no other fodder than is grown on the farm. They are located on all types of farms throughout a wide range of rainfall and soil. The conditions vary from the rich plains of the western area, and river flats throughout the State to the steep hills of Gippsland. The herds are to be found throughout the irrigation districts of Sale and Maffra, to the extensive Goulburn Valley area, and in localities where the herbage and rainfall suggest that sheep farming would be more suitable than dairying.

One other limiting factor known to affect the true average of the good herds, is that the testing period is restricted to 273 days. When these features are borne in mind, the new record is seen to contain much merit.

In addition to the record butter-fat average for all cows, there is a new high level of milk per cow, and also the highest percentage of pure bulls ever used, amounting now to 85 per cent. New figures are shown for the number of units to exceed 300 lb. butter-fat, and for the number of herds to average above 400 lb. butter-fat; while never before has each of the "best twenty mature cows" yielded more than 600 lb. butter-fat. The average yield of 6,164 lb. milk and 285 butter-fat for all tested cows in the Goulburn Valley area, is also a record; while the average herd size is now close to the 40 cow mark.

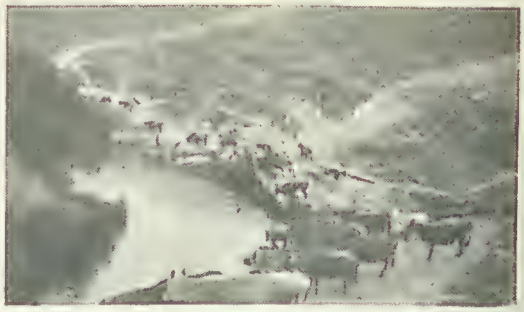
DETAILS OF TEN HIGH PRODUCING UNITS.

Association.	Number of Cows. Completing Test.	Average.		
		Milk.	Test.	Butter-fat.
		lb.	%	lb.
Rochester No. 1	701	6,568	4·91	323
Dumbalk North ..	1,085	6,153	5·05	311
Rochester No. 2	720	6,272	4·83	303
Winchelsea No. 2	354	6,287	4·82	302
Maffra No. 1 ..	1,021	5,876	5·14	302
Tallangatta No. 2	856	6,287	4·76	299
Cohuna ..	1,204	7,033	4·20	295
Kerang	903	5,882	4·96	292
Toora–Welshpool	888	5,396	5·38	290
Winchelsea No. 1	795	6,074	4·77	290

In addition to these outstanding performances, the details of many other splendid yields are to be found in the tables which deal with units in their respective areas.

In all there were 490 herds which averaged over 300 lb. butter-fat. Among the 24 herds which exceeded the unusually high level of 390 lb. were sixteen that reached the coveted level of 400 lb. butter-fat per cow. Where so many herds have shown such excellence, it is a difficult matter to individualize, for in addition to efficient farm and herd management, other factors, such as locality, rainfall, herd size and other environmental conditions go toward making high yields.

In Gippsland 22 units exceeded the average yield of 260 lb. butter-fat per cow, including Maffra No. 1 (1,021 cows, 302 lb. butter-fat) and Dumbalk North (1,085 cows, 311 lb. butter-fat). The Dumbalk North Association operates in the South Gippsland hill country



The steep nature of the Dumbalk North hill country is evident in the above illustration of Messrs. Harrison Bros.' herd.

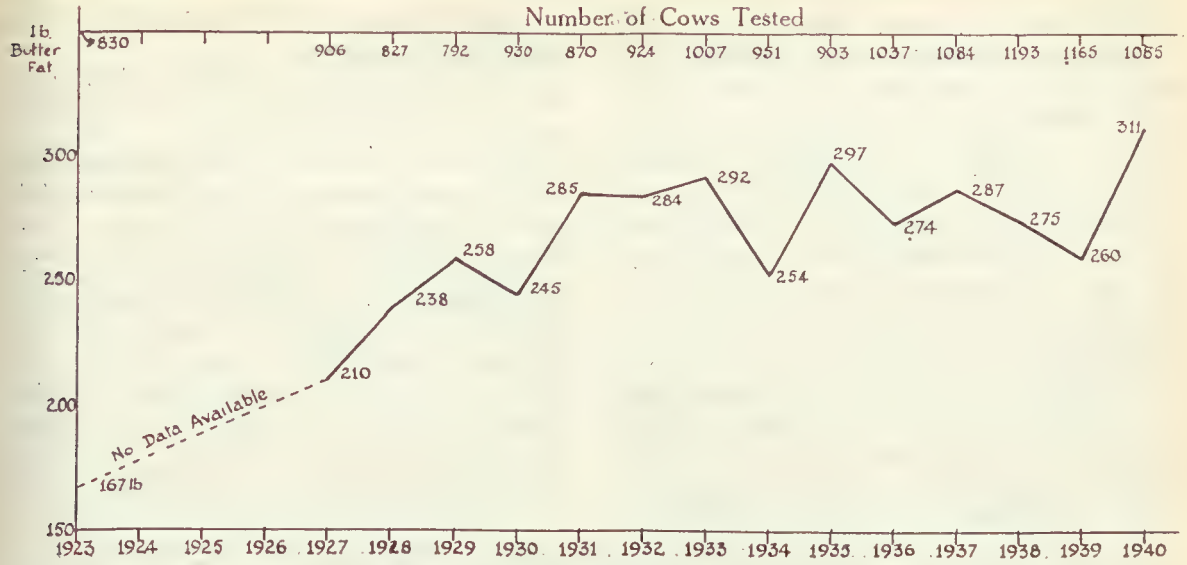
where the annual rainfall averages over 40 inches. However, this rainfall is no greater than in many other areas, and the fine achievement must be credited largely to the efficient management of the herd owners. A graph, which was prepared by Mr. A. Prowse, the secretary and herd tester of the Dumbalk North Association, clearly shows the progress made by the area.

When testing began in 1922-23, the average yield of the 827 cows under test was but 167 lb. butter fat. Last year on practically the same farms, 1,085 cows completed their test for the remarkable average yield of 311 lb. butter-fat. In both years good seasonal conditions prevailed. The progress made may be noted from the comparison given hereunder:—

Year.	Cows Finishing Test.	Average Butter-fat per Tested Cow.	Total Butter-fat.
		lb.	lb.
1939–40	1,085	311	337,435
1922–23	827	167	138,109
Increase in butter-fat output for 1939–40			199,326

These figures refer only to those cows which completed test, but the difference is really greater, for over 1,200 cows were milked; therefore more butter-fat was actually produced. In a general way, it can be said that the area carrying capacity has been increased 50 per cent.; but because of the increased yield of the cows, the area output has been more than doubled.

The credit for this improvement is due in large measure to district herd testing. As an organised body, the members of the local association have investigated farm problems as they arose, and also, studied the methods of the successful farmers of their area. Valuable



Graph showing progress of average yields since the formation of Dumbalk North and District Herd Testing Association.

information has been obtained by attendances at field days far afield, where the practices of successful dairy farmers in other parts of the State were studied. The cleaning up of farms, the eradication of rabbits, the improvement of pastures, the use of artificial manures, the subdivision of holdings and better water service, also had their part in the general improvement.

Since the inception of the Association in 1922, low yielding cows have been steadily eliminated from the herds. The building up of improved herds has been maintained from the progeny of the better cows and selected herd sires.

For many years the Maffra Association has been noted for the high yields of its large herds. On this occasion no fewer than nine are "listed," including the large 99 cow herd of Messrs. Clyne Bros.

The Rochester Association on the other hand has been conspicuous for its high yielding small herds, several this year exceeding 353 lb. This association has averaged over the 300 lb, of butter-fat for many years past.

The leading herd of the No. 2 Unit is also the Association leading herd for the year. The owner, M. Hy. Jackson, was the pioneer herd tester of the Swan Hill Association. While there, he secured from Mr. S. Masters a bull calf from the cow "Chocolate," a 700 lb. butter-fat producer. This bull was largely responsible for the twelve over 500 lb. cows which helped to build up the 459 lb. butter-fat average for the 38 cows in last year's herd. This herd, incidentally, also occupied first place in the previous year's list.

The leading herd of the No. 1 Unit at Rochester is also the second highest of the year for the whole test. This herd, owned by Mr. J. A. Archibald, and the herds of Messrs. D. Thring and H. F. McRae, each have average yields well over 400 lb. butter-fat per cow.

The honour of being the first western area unit to exceed the 300 lb. butter-fat average goes to the small No. 2 Unit of the Winchelsea Association. A very fine performance also was made by the much larger No. 1 Unit. The rainfall in this area is not high, and there is no irrigation scheme. The results achieved, therefore, indicate that a high level of efficiency has been reached by the members of this Association.

In the North Eastern corner of the State at Tallangatta, the 300 lb. level was missed by

Mr. J. A. Newton's 3-year-old "Robin"; 555 lb. butter-fat.

1 lb. butter-fat per cow. Several remarkable herd performances considerably helped in this achievement, the most noticeable being Messrs. L. J. Hanley (28 cows, 423 lb. butter-fat), R. Lukin (20 cows, 398 lb. butter-fat), E. Harris (16 cows, 397 lb. butter-fat), and J. A. Jewel (40 cows, 389 lb. butter-fat).

Mr. T. Lees' 40 cow herd from Cohuna heads the 40 to 59 cow list with an average yield of 402 lb. butter-fat. Messrs. E. Maud, W. Hornsby, and H. and W. Thompson each have splendid herds in this section, all with yields exceeding 350 lb. butter-fat. In the 60 to 79 cow section, no fewer than 23 herds exceeded the 300 lb. standard. The leader of this section, Mr. E. J. Bingham of the Warragul Association, has been prominent for some years past. On this occasion the performance of his 78 cows in averaging 366 lb. butter-fat is an exceptionally good one.

Nineteen cows exceeded 400 lb. butter fat. This number includes six that entered the 500 lb. class.

The 365 lb. yield of Messrs. Harrison Bros., 77 cow herd is also a fine performance. This herd is located at Milford on one of the steepest properties in the Dumbalk area.

It is accepted as a general rule that high herd averages are more difficult to obtain as the cow numbers increase. Of many fine herds numbering more than 80 cows, four are from Kiewa. The owners are Messrs. Alan Crosthwaite (91 cows, 308 lb. butter-fat), H. J. Clark (80 cows, 327 lb. butter-fat), R. E. Knox (112 cows, 276 lb. butter-fat, and A. D. Ford (82 cows,

TWENTY LEADING COWS, WITH DETAILS OF OWNERSHIP, IDENTIFICATION OF PRODUCTION.

Owner.	Association.	Name of Cow.	Brand.	Milk.	Test.	Butter-fat.
Wilkinson & McDonald	Kerang	Darkie	H53 26	16,183	4·70	763
Finlay Bros. ..	Toora–Welshpool ..	Nancy	T W 80 30	11,913	5·90	703
C. M. Runciman ..	Swan Hill ..	Sapphire 2nd ..	Reg. Jersey	13,613	5·10	695
Clyne Bros., No. 3 Farm	Maffra No. 1 ..	Merle	V18 131	11,580	5·80	679
J. G. Howell ..	Leongatha No. 1 ..	Trixie	L 14	12,093	5·58	677
O. S. Martin ..	Traralgon No. 1 ..	Fleck	E 7 154	12,275	5·40	663
J. M. Newton ..	Myrtleford–Whorouly	Crissie 3rd ..	Z 26 33	13,506	4·90	661
L. J. Hanley ..	Tallangatta No. 2	Violet	J 19 47	9,830	6·69	658
T. Gaw	Wonthaggi ..	Dawn 9th ..	Reg. Jersey	11,083	5·90	654
E. J. Brady ..	Traralgon No. 2 ..	Auburn	E 76 55	11,369	5·70	648
T. G. Hine ..	Bacchus Marsh ..	Dora	BB 24 29	10,663	5·83	621
S. Esler	Undera	Gem	UD 41 52	10,165	6·10	620
V. P. Merkel ..	Tallangatta No. 2 ..	Heather	J 3 3	11,017	5·61	619
J. M. Newton ..	Myrtleford–Whorouly	Viola 18th ..	Reg. A I S	10,995	5·60	617
C. G. Runciman ..	Swan Hill ..	Melba	64 1	12,329	4·99	616
J. Wills	Bacchus Marsh ..	Lerderderg Spring Violet	Reg. Friesian	14,831	4·15	616
L. Pay	Kerang	Rose	H 54 V 7 140	13,541	4·54	615
W. Clement ..	Maffra No. 1 ..	Lady		14,763	4·00	604
L. Semmens ..	Maffra No. 1 ..	Brown Mite ..	Reg. Jersey	11,235	5·30	604
H. R. Heath ..	Leitchville ..	Madge	AH 17 115	9,664	6·21	601

275 lb. butter-fat). Mr. Neil McKinnon (93 cows), has again exceeded the 300 lb. level, while Mr. J. McKinnon, of Ecklin, with fewer cows, has a higher herd average. Messrs. F. C. Williams, Narracan No. 1 (90 cows), Lineham, Bunyip (80 cows), T. and G. Major, Cohuna (87 cows), A. J. Boyd, Pomborneit (81 cows), and Macknamara Bros., Werribee South, (132 cows), all exceeded the 300 lb. average yield of butter-fat.

One of the interesting lists is that which includes the herds of from 20 to 39 cows. Every herd in this list exceeded 365 lb. a cow. Among the leaders are herds from widely separated areas of the State. Many are from the irrigation areas of Rochester, Swan Hill, Leitchville, Kerang, North Murchison, North Shepparton and Maffra.

Mr. A. C. Bentley (21 cows, 410 lb. butter-fat), Mr. A. G. Crombie, Dumbalk (26 cows, 407 lb. butter-fat), Mr. W. Wade, Maffra (35 cows, 381 lb. butter-fat), lead several other excellent Gippsland herds; while Mr. C. E. Wines, of Woodford (23 cows, 421 lb. butter-fat) represents the western area. Mr. J. A. Newton, of Myrtleford (35 cows, 416 lb. butter-fat), and Mr. L. J. Hanley, of Tallangatta, also splendidly represent the north-eastern valleys.

A perusal of the Association's yields and the various lists of herds and cows is needed to fully appreciate the great work being done in so many areas. Intimate knowledge of the farm and herd history is needed to allow a satisfactory appraisement of each performance to be made.

Weevil Damage to Stored Grain—*Continued from page 518.*

If there is any reason to suspect that these bags have been badly infested with "weevils," they should be given one of the following treatments—

(*a*) heat treatment—it is recommended that such bags be dipped in boiling water for a period of five to ten minutes, which will destroy all stages of "weevils," and cause only a minimum shrinkage of the bags. A forty-four gallon oil drum is considered very suitable for the purpose, and after treatment, the bags should be hung out to dry.

(*b*) fumigation—a thorough fumigation with carbon bisulphide will also prove satisfactory. The bags should be placed in some receptacle such as an old tank or empty drum, and then carbon bisulphide poured on to the top layer of bags at the rate of 8 lb. carbon bisulphide per 1,000 cubic feet of space. For an ordinary forty-four gallon oil drum, 1 oz. of carbon bisulphide is all that is necessary. After closing over the top as thoroughly as possible, the fumigation should proceed for a period of forty-eight hours. The bags should then be taken out and thoroughly aired. It must be remembered that carbon bisulphide is inflammable and that no naked lights of any description should be present during the fumigation.

Seed Wheat.

Dry pickled seed wheat is immune to weevil damage, and therefore the earlier the routine operation is completed, the safer such wheat will be.

Summing up the whole position, in order to reduce losses to wheat from weevil attack during the coming storage period, wheatgrowers are urged to observe the following:—

(1) *Do not harvest until all the grain is ripe. The presence of any "green" or immature wheat may cause serious losses during storage.*

(2) *Thoroughly clean out all harvesting machinery in order to remove the first source of weevil infestation.*

(3) *Keep new season's wheat on the farm well away from wheat, barley, oats, bran or pollard stored in barns, sheds, or farm silos.*

(4) *If secondhand bags have to be used for carting wheat to the silos, they should be adequately treated beforehand if they are suspected of carrying weevils.*

(5) *Arrange for seed wheat to be pickled as soon as possible.*

Barley and oats are equally subject to weevil attack, and similar methods should be adopted for their protection.

Mallee Research Station—*continued from page 532.*

Oat variety plots at the Mallee Research Station.

TABLE XIII.—OAT VARIETY TRIALS, 1932–39.

—	Hay Section.		Grain Section.	
	Average, Eight Years, 1932–39.	Average, Four Years, 1936–39.	Average, Six Years, 1934–39.	Average, Four Years, 1936–39.
	cwt./ac.	cwt./ac.	bus./ac.	bus./ac.
Dawn	25·8	21·0	19·3	21·3
Guyra	25·6	21·6	20·4	22·4
Gidgee ..	25·3	22·6	18·1	20·6
Mulga	25·1	21·8	20·6	22·2
Lachlan ..	24·6	19·1	19·2	21·2
Algerian ..	23·8	18·9	19·6	20·7
Algeribee ..	..	21·2	..	21·2
Palestine x Dawn R4–1–1 ..	..	20·4	..	25·8
Early Kherson ..	..	20·0	..	24·6
Palestine x Dawn R46–2–1 ..	..	19·6	..	24·8
Ideal	..	18·2	..	21·4

Oats are notoriously difficult to harvest satisfactorily owing to the difficulties experienced in stripping all varieties under similar conditions. It is evident that the earlier maturing varieties give higher yields of grain unless good rains are received in the late spring. A large number of new crossbreds and selections is now under observation, and efforts are being made to produce varieties which will withstand storms to a greater degree than existing varieties.

Table XIII. reveals that the new variety Algeribee, formerly known as Algerian P5, has given better results in both hay and grain yields than Algerian at the Mallee Research Station. Algeribee was produced at the State Research Farm, Werribee, and appears to be destined to replace the standard Algerian variety as a late maturing type throughout the State.

This year the oat variety trial which was sown late in April, on wheaten stubble land with 40 lb. of superphosphate per acre consists of eleven varieties. A rate of seeding trial is also combined with the above, each of the varieties being sown at three seeding rates. These provide that each variety is sown with the same number of grains (6, 12, and 18) per foot.

These rates correspond to Mulga sown at 30 lb., 60 lb., and 90 lb. of seed per acre. The experiment is divided into three sections, one for hay, one for grain, and on the third section, grain yields are obtained after one early grazing.

An early crop of Mulga oats at the Mallee Research Station.

Rate of Seeding Trials with Oats.

This trial has now been incorporated in the variety trial as described above, so that further information may be obtained as to the most desirable seeding rates for the various varieties of oats when sown for hay, grain, or grazing.

The results obtained during the past two years are shown in Table XIV. The yields shown for each rate of seeding are the average of all varieties included in the variety trial.

TABLE XIV.—OAT RATE OF SEEDING TRIALS (ON STUBBLE LAND), AVERAGE YIELD, TWO YEARS, 1938-39 (FIFTEEN VARIETIES).

Treatment.	Hay Yield.	Grain Yield.	
		Ungrazed.	Grazed once.
	cwt./ac.	bus./ac.	bus./ac.
Seed approx. 30 lb. per acre	26·0	26·4	11·8
Seed approx. 60 lb. per acre	24·9	26·4	13·0
Seed approx. 90 lb. per acre	25·7	26·4	11.7

During previous years, rate of seeding trials have been sown with Mulga, Algerian, and Dawn varieties.

Prior to 1935, hay yields only were obtained from these tests, but since that year grain yields also were obtained.

TABLE XV.—RATE OF SEEDING TRIALS—OATS.

Hay Section—Cwt. per Acre.

Rate of Seeding.	Average, Five Years, 1933-37, Algerian.	Average, Four Years, 1933-36, Mulga.	1937, Dawn.
30 lb. per acre ..	21·5	18·3	17·3
50 lb. per acre ..	22·0	19·9	17·7
70 lb. per acre ..	23·1	19·5	18·2

Grain Section—Bus. per Acre.

Rate of Seeding.	Average, Three Years, 1935-37, Algerian.	Average, Two Years. 1935-36, Mulga.	1937, Dawn.
30 lb. per acre ..	14·3	16·4	13·2
50 lb. per acre ..	15·2	15·0	14·4
70 lb. per acre ..	15·8	15·6	14·1

In the past, it has been considered that, under Mallee conditions, oats should not be sown heavier than 50 lb. per acre, but investigations at the Research Station, during the past six seasons, indicate that the heavier sowings, up to 70 lb. per acre, have given slightly greater yields of both hay and grain, and other detailed studies have proved that, as might be expected, much more feed is given by the heavier sowings when it is desired to feed off the crop.

Because of the upright early growth and sparse stooling habits of the early and mid-season varieties, it is natural to consider that they should be sown considerably heavier than Algerian. Tests have not substantiated this belief, as it has been found that Algerian responds to heavier seeding in much the same way as Mulga.

Manurial Trials with Oats.

Tests have been sown to determine the effect of various applications of superphosphate, and super. and ammonia fertilizer mixtures. This experiment, which was sown with Mulga oats on wheaten stubble ground, has shown that small increases of hay can be obtained by the use of super. and ammonia mixtures in this district, but so far the increases have not been sufficiently large to pay for the cost of the fertilizer.

Results obtained so far show that the use of more than 30 to 40 lb. of superphosphate per acre with oats on stubble is not justified.

TABLE XVI.—OAT MANURIAL TESTS (ON STUBBLE LAND), AVERAGE SIX YEARS, 1934-39.

Treatment.	Yield.
	Cwt. Per Acre.
No manure	17·1
Super., 30 lb. per acre	18·1
Super., 60 lb. per acre	18·5
Super., 30 lb., ammonium sulphate, 30 lb. per acre	18·6
Super., 60 lb., ammonium sulphate, 30 lb. per acre	19·9
Super., 60 lb., ammonium sulphate, 60 lb. per acre	20·3

To determine if the superphosphate sown with the preceding wheat crop has any beneficial effect on stubble sown oats, plots have been sown in each of the last two years, without manure on the site of the wheat manurial trial in the preceding year. In this manner

the residual effect on oats from the application of 30, 60, 90, 120, and 150 lb. of superphosphate to the wheat crop should be determined.

The results obtained from this trial are shown in Table XVII.

TABLE XVII.—RESIDUAL MANURIAL TRIAL (OATS ON WHEAT STUBBLE LAND), AVERAGE THREE YEARS, 1937-39.

Treatment. Wheat in the Previous Year.	Oats, 1937-39.
	Cwt. Per Acre.
No manure	27·2
Super., 30 lb. per acre	29·8
Super., 60 lb. per acre	29·6
Super., 90 lb. per acre	31·0
Super., 120 lb. per acre	32·2
Super., 150 lb. per acre	31·5

The results to date indicate that superphosphate applied with the wheat on fallow also has a beneficial effect on the subsequent stubble crop, the greater benefits being derived from the heavier dressings.

In addition to the above tests on stubble ground a series of oat plots for hay has been sown to test the effect of super. on this crop when sown on fallowed land.

The results show that when oats are sown on fallowed land they give a marked response to superphosphate.

TABLE XVIII.—OAT MANURIAL TRIAL ON FALLOW.

Treatment.	Mulga. Av. 3 years 1937/39.	Algerian. Av. 2 years 1938/39.
	cwt./ac.	cwt./ac.
No Manure	29·8	23·6
Super 30 lb. per acre ..	37·1	27·0
Super 60 lb. per acre ..	38·6	29.7
Super 90 lb. per acre ..	39·0	30·1

Oat Grazing Trials.

In 1935, experiments were commenced at the Mallee Research Station, Walpeup, with the object of determining the comparative suitability of oat varieties for grazing, for either portion or the whole of their growing period.

The green feed produced by the varieties under test was determined by cutting and weighing samples, and the number of sheep carried on the various plots was also recorded.

Oats for grazing should be sown as early in the season as possible. If sown dry, they can come away with the first rains and provide early winter feed.

To compare the amount of grazing provided by the three principal varieties when sown on stubble land, without manure, for grazing throughout the season, a comprehensive test at equivalent thicknesses of seeding, ranging from 50 to 60 lb. per acre, was conducted over a period of three years (1935 to 1937).

Oat variety grazing trials—Left, ungrazed right, grazed.

Three 1-acre plots of each variety were sown with the combine in April, the feed produced being fed off throughout the growing period by sheep grazing on one plot of each variety simultaneously, and then moving to the second and third series in rotation. The number of sheep used at each grazing was adjusted to the feed available, and a record kept of the number of sheep-days (number of sheep multiplied by days of grazing) for each plot of each variety. The dates and times of grazing vary with the seasonal conditions, but each plot was grazed four times from July to

November, in 1935 and 1937, and five times in 1936. The results of this experiment showed very clearly that most feed at the first feeding-off in July, was provided by the early maturing type, Mulga, but that Dawn, the mid-season type, was very little behind, and excelled in the August and September grazings. The late maturing type, Algerian, gave the greatest quantities of feed in the late grazings, as it responded most to the late spring rains.

In a normal year the value of the feed is greatest in the winter, but green feed in November, after the native grasses have gone to seed, is very useful for late lambs. Considering the feed produced throughout the season, Dawn gave 10 per cent. more, and Mulga 6 per cent. less than Algerian.

As grazing may be carried out over part of the growing period only, a comparison of the amounts of early green feed produced, and the ability of the different varieties to recover and produce grain is important. The results of this work, together with the yields of grazed and ungrazed plots, are given in Table XIX.

The varieties in Table XIX. are arranged in their normal order of maturity. It will be seen that the early and mid-season varieties have produced the greatest amounts of green feed at the grazing in July. Also that the subsequent grain yield of all varieties tested is seriously reduced by grazing. The varieties Palestine x Dawn R4-1-1, Fulghum, and Ideal show up to advantage in this direction. An examination of the yields obtained in individual years and the incidence of the rainfall shows the importance of the spring rains in determining the recovery after grazing. If good late rains are received, the later-maturing varieties recover much better than the early types, but in the absence of such rains the yield reductions as a result of feeding-off are just as great in the late as in the early varieties. In general, the early-maturing oats cannot be grazed as late as Algerian if equivalent hay or grain yields are desired.

A factor of importance in determining the recovery of oats after grazing is the habit of growth of the plant. There are two distinct phases in the growth of cereal plants, the grassy or rosette stage, and the upright or reproductive stage. Grazing a crop in the grassy stage does not affect the main stools, but this grazing should be discontinued when the plant begins upright or stemmy growth; with oats sown early in May this occurs about the end of July for early varieties at Walpeup, and about a month later for Algerian. It has been found that even among varieties that ripen at the same time, there are big differences in the length of the grassy stage. Fulghum and Dawn, if ungrazed, ripen at approximately the same time, but Fulghum commences upright growth nearly a fortnight later than Dawn. It has been found that the grain yield of Fulghum is less affected by grazing than that of Dawn. The varieties Palestine and Dawn R4-1-1 and Ideal also have a long grassy stage and a short post-jointing stage.

When an oat crop is being sown for the purpose of grazing to stock, much more feed is obtained if heavy rates of seeding are adopted. This is well illustrated by the figures

TABLE XIX.—RECOVERY OF OATS AFTER GRAZING.

Variety.	Average Weight Greenstuff, July, Three Years, 1937 to 1939.	Grain Yields, Average Five Years, 1935–39.		Grain Yields, Average Three Years, 1937–39.	
		Ungrazed.	Grazed once.	Ungrazed.	Grazed once.
	cwt. per acre.	bus./ac.	bus./ac.	bus./ac.	bus./ac.
Mulga x Palestine R6–1–1	19·8	..	..	17·8	10·8
Mulga	18·7	20·2	11·4	21·6	11·0
Palestine x Dawn R4–1–1	19·5	..	..	26·4	16·4
Gidgee	20·2	18·7	11·5	21·3	12·1
Burke	17·1	..	..	24·3	12·5
Early Kherson	17·2	..	..	24·8	11·0
Fulghum	19·7	..	..	21·9	16·4
Dawn	18·0	18·4	10·5	21·3	9·6
Guyra	19·1	19·3	11·6	24·3	10·7
Lachlan	18·3	18·4	10·5	22·6	10·1
Ideal	15·2	18·3	12·9	23·2	13·5
Palestine x Dawn R46–2–1	17·8	..	..	24·9	12·5
Algeribee	18·4	..	..	21·6	10·6
Algerian	16·0	18·0	12·0	21·8	10·9

in Table XX. which gives the average weights of greenstuff obtained by sampling the rate of seeding trials in July. The yields given are the average weights of all the varieties tested.

TABLE XX.—YIELDS OF GREENSTUFF.

Oat Rate of Seeding Trial, Average 3 Years, 1938-40.

Approx. Rate of Seeding; lb. per acre.	Yield of Greenstuff; cwt. per acre.
30 (6 grains per ft.)	15.2
60 (12 grains per ft.)	16.7
90 (18 grains per ft.)	20.4

From the above, it is seen that oats grown with the object of feeding-off should be sown thicker than normal. Rates of up to 70 lb. per acre may be applied with advantage in such cases. If the season turns out to be so favourable that grazing of the oat crop is unnecessary, no loss, and probably a gain will result from the heavier seeding.

There are large variations in the size of the grain of different oat varieties. This factor should be borne in mind when deciding the seeding rate to be adopted. For example, the grain of Burke is approximately 30 per cent. smaller than that of Mulga, and to give comparable seeding rates, Mulga would be sown at 60 lb. and Burke at 40 lb. of seed per acre.

Experiments indicate that the use of manures sown with the oats on stubble, to increase the amounts of grazing provided, is not justified under Mallee conditions.

A number of cereals, including barley, wheat, and rye-corn, have been tested to determine if they would provide more green feed than oats. Rye-corn outyielded oats for green fodder, but is not to be preferred to oats for early grazing if the crop is to be allowed to recover for hay or grain.

TABLE XXI.—YIELD OF GREENSTUFF FROM VARIOUS CEREALS, 1937-39.
(Moisture 80 per cent.)

Variety.	1st Grazing.	2nd Grazing
	cwt./ac.	cwt./ac.
Black Winter Rye	14·3	14·1
Dawn Oats..	10·0	8·8
Ranee 4H Wheat	9·5	10·7
Cape Barley	8·3	9·9

CEREAL DISEASES.

Flag Smut Investigations.

Wheat varieties differ in the degree of their susceptibility to flag smut, and one of the most promising means of control lies in the direction of breeding varieties which are resistant to the disease.

Infection in the field generally takes place from the spores or seeds of the disease present in the soil. Experimental tests are made by dusting the grains of the varieties to be compared with spores gathered from diseased plants in the previous season.

Inheritance of Resistance to Flag Smut in Wheat.
Row 1—Resistant; Rows 2 and 3—Susceptible to disease. The three selections are the progeny of a mating between Nabawa (resistant) and Indian H (susceptible).

The importance of this disease in reducing the possible yield of susceptible varieties is shown in the results of the yield trial which was sown in 1933 with infected and clean seed of four varieties.

TABLE XXII.—RESULTS OF YIELD TRIAL, WALPEUP, 1933.

Variety.	Clean Seed.	Infected Seed.
	bus./ac.	bus./ac.
Nabawa (resistant) ..	14·9	14·7
Ghurka (resistant) ..	20·4	17·7
Free Gallipoli (susceptible)	17·5	5·2
Federation (susceptible) ..	13·9	4·4

Other factors affecting the disease which have been studied, include time and depth of sowing, pickling, cutting back (or feeding off), and the application of various fertilizers.

Results of these trials show that, in addition to the standard methods of control such as the burning of infected stubbles, fallowing, and rotation of crops, adequate manuring with superphosphate, and efficient pickling with standard powders tend to reduce the losses caused by this disease. Other aspects of the disease are being studied further and chemical analyses of susceptible and resistant varieties are being made.

These experiments have shown that infection by flag smut of a susceptible variety of wheat is governed to a large extent by the concentration and balance of minerals in the soil. A deficiency or an excess of calcium within the plant results in a reduction in the development of the disease, while a phosphorus deficiency increases the degree of infection. The application of superphosphate, or ammonium sulphate, to the soil, assists in reducing the incidence of the disease. The former manure increases the amount of phosphoric acid available to the plant, while ammonium sulphate has an indirect action on the absorption of calcium. Mallee soils are, in general, high in calcium (lime) and low in phosphates; and this may be one of the reasons why crops in the Mallee areas usually show a greater infestation with flag smut than those in other parts of the State.

The most important result obtained from these investigations is the discovery of varietal resistance in Ghurka and a classification of the commoner wheat varieties in accordance with their reactions to the disease, has been made.

Very Susceptible ..	Baldmin Federation Regalia Free Gallipoli Waratah Early Gluyas
Susceptible ..	Mac's White Nizam Ranee 4H Bobin Yandilla King Rajah Gluclub Sepoy
Moderately Resistant	Joffre Ford Currawa Gular
Resistant ..	Totadgin Ghurka Sword Dundee Carrabin Geeralying Nabawa Bencubbin

On badly infected areas it is recommended that a resistant variety, such as Bencubbin or Ghurka, be sown.

Ball Smut Control.

The efficacy of various dry pickling powders for the control of ball smut in wheat and the effect of the more common powders on the germination and yield of wheat when clean seed is pickled, are being tested out. In this latter section, the results obtained have failed to show any differences in yield due to the pickling treatment.

TABLE XXIII.—WHEAT PICKLING TRIAL.
Average, Two Years, 1938-39.

Treatment.	Yield.	Germination.
	bus./ac.	per cent.
Copper Carbonate, 2 ozs. per bushel	19·0	77
Mercury Compound C, 1½ ozs. per bushel	18·8	83
Mercury Compound A, 1½ ozs. per bushel	18·8	79
Unpickled	18·7	84

In the trial to compare the effectiveness of various brands and types of dry pickling compounds in controlling ball smut, three copper carbonate treatments and six mercury compounds are under investigation. The method of testing is to sow small drill plots, the seed of each plot having been artificially infected with spores of the disease and subsequently pickled, usually at the light rate of 1 oz. per bushel. Counts of the infected plants are made before harvest in order to determine the percentage of disease in the crop.

This trial indicates that most of the copper compounds now on the market are satisfactory in controlling bunt. There are substantial differences between the new mercury compounds, but the better brands are more effective in controlling ball smut than the dry copper compounds and the fact that reduced quantities per bushel can be used somewhat offsets the higher cost of materials. Seed pickled with mercury powders is cleaner to handle and runs more freely through the drill, but owing to the extremely poisonous nature of the mercury pickles, considerable care should be taken in using them.

Loose Smut Control.

The control of loose smut is much more difficult than that of ball smut, as in the former the disease is enclosed within the grain and therefore not killed by pickling powders. The recognized method of control is a hot water treatment, but it is not easily applicable to large quantities of seed.

Recent work in the Punjab, India, indicates that high sun temperatures may be utilized to heat the water in which the grain is immersed, providing it is immersed for a longer period than is necessary when the water is artificially heated. The practicability of control of loose smut by this method is being tested. A good measure of control by this method is being obtained and grain so treated dries quickly in the summer, and thus presents no difficulties at sowing time.

Efforts are also being directed, at the State Research Farm, Werribee, to the production of varieties resistant to loose smut, and in this regard the variety Forward, which is resistant to the disease, but which is a poor yielder under Mallee conditions, has been mated with the more prolific but susceptible local varieties.

Other Cereal Diseases.

Various organisms causing root rots in cereals have been recorded at Walpeup. As so many species are present, the control of these diseases —root rots, foot rots, and take-all—is very difficult, and several species may be present in the one diseased plant.

The following are some of the diseases which have been identified at the Station.

Wheat. — *Ophiobolus graminis* (take-all), *Fusarium culmorum, Helminthosporium* spp., *Curvularia ramosa.*

Oats.—*Curvularia ramosa, Rhizoctonia solani* (purple patch).

Barley. — *Helminthosporium* spp., *Fusaraium* spp., *Curvularia* spp.

Pasture Investigations.

One object of the Station work is to demonstrate whether the carrying capacity of Mallee land can be increased substantially by means of sown pastures such as lucerne, Wimmera rye-grass, or other introduced species. Trials to-date give some promise in this direction, but more investigation is required before definite recommendations can be given.

Large increases in carrying capacity are required to justify much expenditure on seed and manure for sown pastures in the Mallee. To be economically successful, a sown pasture in the Mallee must be cheaply established and produce superior or more feed than natural pasture over a number of years.

The cheapest forms of artificial pasture are probably sown cereals, or Wimmera rye-grass sown with the previous crop. Promising legumes are lucerne and Barrel Medick.

A feature introduced in 1934 was the establishment of a small pasture plant nursery. In this, seeds of drought-resistant species obtained from various parts of the world were tested. Observations were made on their growth, persistence, and suitability for Mallee conditions and, in 1939, the more promising were promoted into a Pasture Species Trial in which the various species are tested under field conditions.

Excellent conditions for germination and growth were experienced during the winter of 1939, and most of the species sown became well established. The 1940 season provided a very severe test of the drought resistance of the various species. The perennial plants have shown to advantage in this respect, as most of

Lucerne sown in rows 35 inches apart, at the Mallee Research Station in 1939.

Barrel clover in pasture plant nursery in 1939.

the annuals were severely checked by lack of rain during the critical period following their germination in April.

Lucerne, by its deep-rooted habit when established, has demonstrated at Walpeup its ability to withstand dry conditions, although a stand sown in 1935 died in the 1938 drought. The plots sown in 1939 showed fair growth over the summer and autumn months of this year, and have been grazed three times. Although it is too early to draw conclusions on the results of the trials commenced last year, they will provide useful information as to the most suitable variety to sow, the methods of establishment, rates of seeding and spacing between rows. It would appear that a light sowing of approximately 2 lb. per acre of seed, sown with a wheat crop on fallow is a practical means of establishing lucerne under Mallee conditions.

Perennial Veldt Grass (*Ehrharta calycina*) has given an excellent, though tussocky growth, and is the best of the perennial grass species. Although coarser in appearance than other grasses, it is quite palatable to sheep. Crested Wheat Grass (*Agropyrum cristatum*) and Phalaris tuberosa are the best of the other perennials, while Bulbous Blue Grass (*Poa bulbosa*) is very drought resistant, but does not provide much feed. Among the annuals, Wimmera Rye Grass and Barrel Medick show the most promise.

With most of the species tested, the use of a cover crop did not materially affect their establishment. Phalaris tuberosa was, however, an exception, and a much better stand was obtained in the absence of a cover crop. Very little, if any, grazing can be expected from sown pastures in their first year, and the use of a cover crop is a means of reducing the cost of establishment. In addition to providing some return from the land during this period, the crop affords the young pasture plants some protection from drifting sand during the early stages of growth, and the stubble left after harvest, protects the plants during the critical summer months.

Although the pastures sown in 1939 have been grazed, care has been exercised to prevent overgrazing as this practice is known to be very detrimental to the life of the plants. To determine the response to top-dressing, three manural treatments, viz, no manure, super. 45 lb., and super. 90 lb. per acre, have been carried out in strips across the plots. The season has, however, been too dry for any differences in growth due to manural treatment to become very apparent.

The trials sown this year are very similar to those sown in 1939. Species which failed to give satisfactory growth in the past season have been omitted, while those which showed promise in smaller trials have now been included in the larger plots. These include Strawberry Clover (Palestine strain), Small Burr medick (*Medicago minima*), and Arabian grass (*Schismus barbatus*). A number of mixed pasture species was also included. Climatic conditions experienced were so severe that germination and growth were very limited.

Special attention is being paid to species which have become established naturally in the district, and attempts are being made to select strains which will provide more feed than the natural ones do at present. Small burr medick is one of the species receiving attention in this regard. A small trial area has been sown to test some new introduced varieties of peas as a possible forage crop in the Mallee.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
State Research Farm	Werribee	211	Gorman, A. W. ..	"Cathcart," Alexandra	64
Payne, A. E. T. ..	"Yarra View," Lilydale	77	Samuel, B. T. ..	Lang Lang	60
Dennis, Mrs. A. A. ..	Frankston	19	Powell, T. S. ..	"Carellen," Mansfield	41
Reid, Ralph G. ..	"Holmwood," Koowee-rup	78	Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	16
School of Horticulture	Burnley	6	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	31
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	Onley, W. H. ..	"Glenholme," Caldermeade	52
Banyule Stud Pty. Ltd.	Heidelberg	63	Payne, T. E. N. ..	"Woodburn," Kilmore	57
Black, Miss Grace ..	Mount Noorat ..	35	Holloway, R. W. ..	Caldermeade ..	54
Black, Estate, Late I. S.	"The Cottage," Mount Noorat	46	Dookie Agricultural College	Dookie	81
Read, Estate, Late John D.	"Springhurst Estate," Springhurst	112			
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17			

Care of the Horses' Teeth

For a horse to obtain the greatest benefit from its food it is essential that the teeth should be in good order. Only regular inspection and attention will ensure this.

To enable the animal to crush the grain in the feed, the grinding surface of the molar or back teeth must make proper contact. This grinding of the feed keeps down excessive growth of the teeth, but if the surface of the teeth do not make proper contact, portions of the teeth grow into sharp ridges and points. If on the lower teeth, these irregularities cut the tongue, while those on the upper teeth cut the cheeks. When this occurs the horse may allow some of his feed to drop into the manger, where it will be noticed to be wet, or else he may swallow it before it is properly masticated and an attack of colic may ensue.

The animal becomes a "bad-doer" and gradually loses condition and strength. Treatment consists of rubbing down the sharp points with a tooth rasp. Care should be taken not to rasp down the grinding surface of the teeth.

When the first or foal teeth are being shed, a careful examination of the mouth is necessary, as sometimes one of them becomes wedged between permanent teeth, which consequently grow out of place and spoil the appearance of the horse's mouth, as well as allowing food to collect and decay there. No horse is ever at its best unless its teeth are in good order, and periodical inspection and attention to the teeth will be well repaid.

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Results of 1939 Trials

Extracts from the Eighth Annual Report of the Experimental Pasture Work conducted by the Department of Agriculture for the Victorian Pasture Improvement League

By R. L. Twentyman, B.Agr.Sc., Agrostologist

THE experimental pasture work conducted by the Department of Agriculture under arrangement with the Victorian Pasture Improvement League was begun in 1932, but this report is confined mainly to the results of the experiments measured or observed during 1939.

The work was undertaken to determine the best methods for the improvement, establishment, and maintenance of pastures under Victorian conditions. In the early years the experimental work was confined to the dry land pastures of southern Victoria, but in 1935 the work was extended to the irrigation districts of the North and in 1938 to the dry land pastures of the North-Eastern District.

The plan of experimental work was designed to ascertain if pasture growth could be improved by means of fertilizer treatment, the introduction of better pasture species, improved pasture management, or by the adoption of the system of intensive rotational grazing.

Wherever practicable, measured records of the pasture growth resulting from the various treatments have been made. On the mowing manurial trial areas, the measurements are made by means of cutting and weighing the produce from the variously treated strips. Larger grazing areas were also used for fertilizer trials, in which differences in production were measured by means of grazing animals. This method failed to give a satisfactory measure of yield differences which were quite apparent to the eye, but the swards on these areas have furnished a useful comparison with the vigour and growth and botanical composition of the swards on the manurial mowing trials. The Pilot plots and the pasture mixture and species trials have been used solely for observational purposes.

General Results, 1932-39.

A discussion of the objects and purpose of the work and the results which had then been achieved was given in considerable detail in the annual report for 1937; but, in view of the very abnormal weather conditions recently experienced, it now seems desirable to review the previous findings. Some modification of the previous conclusions reached in respect to the perenniality and persistence of perennial rye grass and *phalaris tuberosa* is indicated from the recent experiences, but it is pleasing to note that, in the main, the past two years' results have served to confirm the conclusions reached in the earlier years.

At the time that the Pasture Improvement League plan of experimental work was begun, there was ample evidence to show that top-dressing of pasture land in Victoria with superphosphate was capable of effecting remarkable increases in growth, but the method was still only practised on a relatively limited scale. At this time other methods, which were stated to be giving good results in New Zealand, were being widely advocated, and it was largely to determine the value of these methods under Victorian conditions that the work was undertaken.

The New Zealand methods then being actively advocated were as follow:—

1. Top-dressing of pastures with unusually heavy dressings of superphosphate.
2. The use of lime in addition to superphosphate.
3. The use of nitrogenous fertilizers to stimulate "out of season" growth.
4. The sowing of *leafier* and *more prolific* pasture species.
5. The practice of intensive rotational grazing (involving grass topping, frequent harrowing to spread dung and to promote "soil aeration," together with heavy artificial manuring).

In choosing the sites for the experimental plots, a wide range of pasture types was selected, as it was expected that different districts and soils would show varying seasonal growth and different fertilizer response, and that the establishment and survival of the various pasture species would vary according to place and soil. The measurements of yield which have been recorded on these representative pastures in southern Victoria have revealed a close similarity in their seasonal growth. The main difference between southern Victorian pastures appears to be due to soil fertility and texture, and situation. Irrespective of the soil or pasture type, almost all Victorian pastures make their strongest growth in the early and mid-spring, and mature and dry off rapidly with the hot dry weather of the early summer (December). Except on low flats and swampy areas, pasture growth during the summer is at a standstill, and growth is not resumed until soaking rains occur in the autumn.

Moderate autumn rains are usually sufficient to promote growth on the loams and sandy soils, but heavy clay soils, which dry out and become deeply cracked during the summer months, require much heavier rains before any material growth appears on them.

After a brief autumn period, in which rather indifferent growing conditions are usually experienced, cold weather generally checks growth and little headway is made during June, July, and August, after which time growth is resumed in the spring. The seasonal growth curves obtained from the various experimental plots show very similar periods of flush and sparse growth irrespective of the species present, or of the manurial treatment given. The cessation of growth is almost complete during the summer months owing to dryness, and during the winter growth is almost at a standstill owing to cold and excess moisture.

These results indicate the difficulty of improving Victorian pastures by means of summer-growing species, and suggest that the most effective means of pasture improvement

A good response to superphosphate on Pakenham pilot plot, spring, 1939.

will involve the introduction of better winter-growing species, or the stimulation of growth by fertilizer treatment during those periods when soil moisture is not the limiting factor.

It is along these lines that pasture improvement in Victoria has been directed of recent years, the greatest success being achieved by the introduction of subterranean clover fostered by top-dressing with superphosphate. Many attempts have been made to promote summer growth by the use of summer-growing and drought-resistant species, but, except where irrigation has been possible or where sub-surface water is available, such efforts have been very unfruitful.

It has been appreciated for many years that the growth on Victorian pastures during the winter and summer periods has been poor, but the mowing trial plots have revealed how very poor growth usually is during these periods. By the adoption of various means some increases in growth can be made at these times, but such periods remain unfavorable for growth.

The only satisfactory way of overcoming these lean periods is to stimulate growth during periods when the pastures are capable of growing, and to conserve the surplus feed for use during periods of scarcity. This necessitates the cutting of grass hay, but the too frequent cutting of grass hay from the pasture must be guarded against, for, as has been clearly revealed during the progress of these experiments, repeated cutting severely depletes the soil's reserves of potash and the pasture eventually reaches a condition of poor growth which cannot be remedied by the use of phosphatic fertilizers alone.

The earlier trials showed splendid responses to manuring with superphosphate, particularly on the lighter soils, but on swards subjected to repeated mowing this good response has not been maintained, except where potash has been applied in addition to the superphosphate.

On improved pastures heavier applications of superphosphate (3 and 4 cwt. per acre) have generally not produced any better results than moderate dressings (2 cwt. per acre).

Lime has been found to be of material value in a few districts, but on most areas it has shown little or no benefit. Nitrogenous fertilizers have given a marked stimulus to growth in the early spring, but have been found to exert a subsequent ill-effect on the pasture, which becomes increasingly severe with repeated dressings.

Potash has given marked results, particularly where the land has been previously subjected to exhaustive cropping or repeated grass hay cutting, or grazed in such a manner that there has been a poor return of dung to the pasture.

The pasture mixture and species trials have demonstrated the superior sward-forming ability and persistence of the elite as compared with inferior strains of pasture plants, but, as many of the well-established local swards now consist of these superior types, it would seem

that their present growth is already as vigorous as soil fertility and climatic conditions will permit.

The plan of "intensive rotational grazing" on non-irrigated land in southern Victoria has not fulfilled the early hopes held for it. With such large variations in seasonal growth as are experienced in Victoria, frequently 75 per cent. of the yearly growth being produced during the three spring months, the method would not justify the cost of the necessary extra fencing and watering.

The main lesson derived from the past three years' results is the all-important influence of weather conditions upon pasture growth in Victoria. Little or nothing can be done to stimulate growth when drought prevails, and extra growth ought to be produced during favourable periods and conserved for supplementary feeding during the lean periods.

It is now considered that, though the general principles underlying the improvement of New Zealand pastures may hold in southern Victoria, the differences in climatic conditions, and the consequent seasonal pasture growth, limit the practical application of such methods in this State.

Growth and Weather Conditions during 1939.

Very abnormal weather conditions were experienced during 1939, and in many districts new temperature and rainfall records were established.

The year was preceded by the exceptionally prolonged and severe drought of 1937-38, which continued into the early part of 1939. Heavy rains which fell over the central, eastern, and north-eastern portion of the State towards the end of February gave relief in these areas, and with the succession of following rains provided probably the most prolific autumn growth on record.

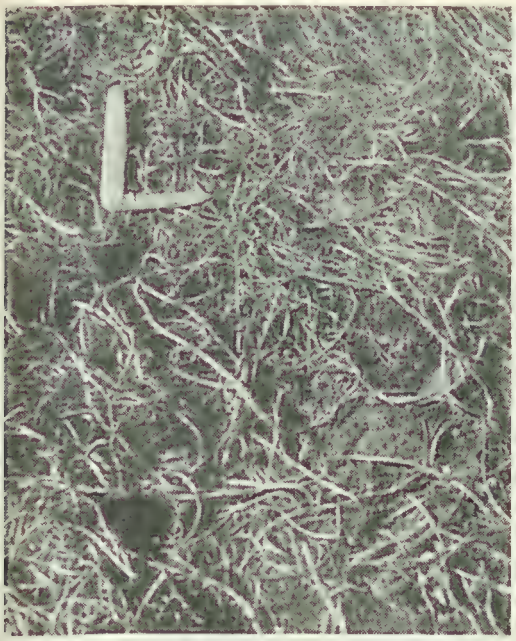
The following rains repeatedly missed the Western District, and in this area the drought was not broken until late in the winter.

The unusually high summer temperatures accompanying the extremely dry condition of the soil resulted in the dying out of much perennial rye grass which had been recently established in the northern districts of the State. In some cases, even the more drought-resistant phalaris failed to survive the severe period.

In some districts when the good autumn break was experienced, the subsequent rains were heavy and prolonged, and the ground became too wet to permit top-dressing being done. Despite this, an unusually prolific growth of annual pasture species and weeds rapidly developed in these districts. Marshmallows, cape weed, and thistles made extraordinary growth on stock camp and night paddocks.

The autumn pasture growth became so prolific in some districts that large areas were cut and made into silage before the winter, unfortunately with rather indifferent results. Pastures in which subterranean clover was present and which had previously been top-dressed with superphosphate showed excellent residual

An unusually strong growth of clover at Woodend, spring 1939. See close up photo of same pasture, on opposite page, taken in spring, 1940, showing complete absence of growth due to dry season.



A section of the pasture shown on previous page, indicating complete absence of growth in spring, 1940.

responses to the earlier fertilizer treatment, but the unimproved native pastures made a very poor response to the favourable weather conditions. Towards the end of the autumn the pastures had grown away from the stock and the winter was commenced with a good cover of green feed on most pastures. This cover seemed to minimize the effect of the winter cold and in many districts fair growth continued throughout the winter.

The prolific rains continued into the spring and encouraged a very heavy growth of pasture, which although generally rather coarse and stemmy, enabled the fodder reserves to be replenished.

The season generally was one of extraordinary productivity, and following immediately after the previous prolonged dry period it came when there was not enough stock available to consume the surplus feed.

The large fluctuations in pasture growth which occur as a result of yearly as well as seasonal changes in weather, indicate the difficulty of promoting growth during unfavourable periods, or of keeping it in check during favourable periods, and suggest the necessity for advancements in fodder conservation methods, which would be more in keeping with the recent improvements of the pastures and the increased stock-carrying capacity of the farms.

Pasture Improvement and Grass Fire Danger.

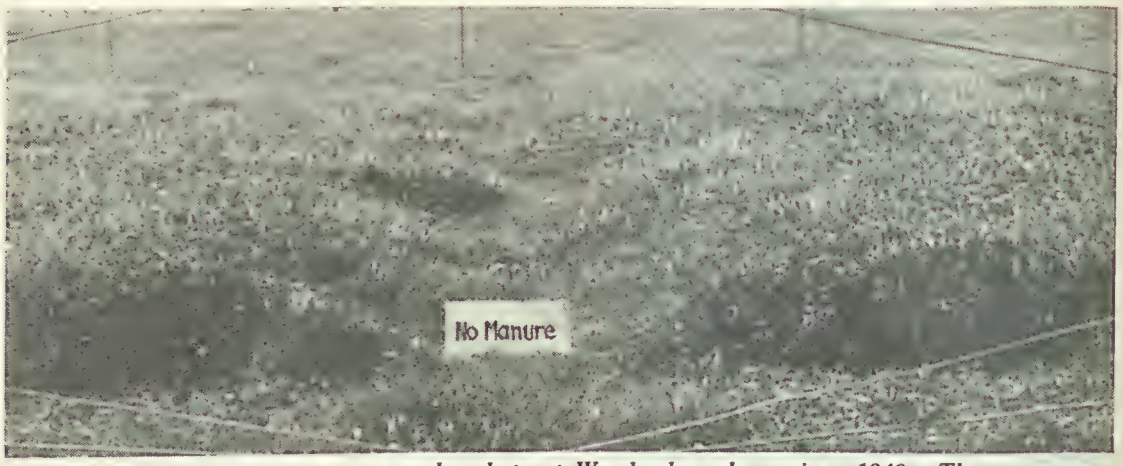
One matter intimately connected with pasture improvement, and to which more attention will have to be given in the future than has been customary in the past, is that of grass fires. Pasture improvement has resulted in a greater abundance of dry feed standing in the paddocks during the summer months, the native grass paddocks particularly increasing in this respect, owing to the greater stock-carrying capacity of the improved paddocks and the preference of the stock for the top-dressed areas. In the summer of 1938-39, when exceedingly high temperatures were experienced, and atmospheric conditions were ideal for sweeping fires, the pastures were too bare to burn, but during the last summer, which except for March was unusually mild, long grass made the fire risk very serious. More by good fortune than good management, except in the North-East, no bad fires occurred during January or February, or results far more disastrous than those produced by the March fires would probably have occurred. The loss of feed is only temporary, but the attendant loss of fencing, stock and buildings is too high a price to pay for the privilege of holding large accumulations of dry grass of high thermal but low feeding value in the paddocks. Once out of hand and fanned by hot winds, it is impossible to muster sufficient men or equipment to control the fire, but a policy of grazing out long, wide firebreaks and stock refuges, begun months before the expected danger period should restrict the fire to blocks and minimize stock losses.

SUMMARY OF RESULTS DURING 1939.

(Non-Irrigated Trials.)

Manurial Experiments.

As a result of the high rainfall received during 1939 the pastures made very strong growth, and once again very good responses to fertilizer treatment were recorded. In the previous dry years the fertilizer enabled the plants to make more effective use of the meagre soil moisture by encouraging stronger growth in the early spring, at which time evaporation was low. During the past year, when there was ample moisture present in the soil, the fertilizer again greatly stimulated growth but it was only the top-dressed or improved pastures that were able to take full advantage of the favourable weather conditions presented. Pastures which had previously been top-dressed, or land which had



An unusually good response to superphosphate at Woodend, early spring, 1940. The no-manure strip has a superphosphate treated plot on either side.

been used for growing fertilized crops, showed very marked residual responses to the fertilizer, but except in the late spring, unimproved native pasture made a very poor response to the favourable season.

In previous years it had been recorded that the response to superphosphate was mainly restricted to the spring, but during the past year unusually marked responses to top-dressing with superphosphate were observed in the late autumn and winter, in those districts which received heavy autumn rains. Where this growth was not grazed off by stock the stimulus to growth was sustained through the winter until well into the spring. In some cases this stimulus to autumn growth resulted in excellent responses to superphosphate being recorded in districts where previously manurial responses were barely visible.

Superphosphate.

Again, as in previous years, superphosphate has given very good results, and it remains by far the most important manure for the improvement of Victorian pastures.

Throughout these experiments the most striking results have been recorded on the lighter soils, whilst less spectacular though more prolonged responses have been obtained on the heavier clay soils. It has become evident, however, that the continued use of superphosphate without due regard for the limited supplies of the other elements necessary for plant nutrition, may bring about deficiencies of these other minerals. On most of the manurial mowing plots where there has been no return of plant remains to the soil an acute deficiency of this nature has been produced, and it is now found that a satisfactory response to superphosphate can only be obtained when potash is applied in addition.

The spectacular responses that have been obtained with superphosphate in ordinary farming practice have encouraged the belief that the phosphates are the only soil minerals worthy of consideration. This is generally correct in the first years of pasture improvement on virgin land, but it does not always hold on land which has been top-dressed for some years or which has been frequently cropped. There is now ample evidence to show that for the maintenance of Victorian pastures in a condition responsive to superphosphate the soil potash supply must not be unduly depleted.

The fact that a pasture gave a good response to superphosphate in its first years of improvement cannot be regarded as proof that phosphates alone will always satisfy its fertilizer requirements. The changes that have been recorded in the responses to the various fertilizers on mowing manurial trials within four or five years indicate that the manurial requirement of a particular pasture may alter quite rapidly.

In the earlier Pasture Improvement League manurial experiments conducted on the dairying pastures, dressings of 2 and 3 cwt. of superphosphate were given, but the heavier dressing did not show any material advantage over the lighter. In the more recent experiments established at Lilydale and the North-east, dressings of ½, 1, 2 and 3 cwt. per acre have been used, and, so far, the moderate dressings have given as good results as have the heaviest dressing.

While the new Lilydale mowing plots have not as yet shown much response to superphosphate, many of the pastures in this district have during recent years been greatly improved as a result of repeated top-dressing with this material, although in some cases it is claimed that lime was required in addition.

The Lilydale mowing plots are situated on pastures which for some years previously had been top-dressed with superphosphate and which had been considerably improved. The response on these experimental plots to the dressings of superphosphate has been poor, but beneficial results have been obtained where both lime and potash have been applied in addition. It appears that these results will confirm those obtained earlier when it was usually recorded that so long as good responses were being obtained from phosphates the addition of other fertilizers was of no benefit. Where the response to superphosphate has been poor, although the soil and pasture has otherwise appeared favourable, it has usually been found that either a deficiency of lime or potash has limited the response to the superphosphate.

Potash.

Very marked responses were again obtained with potash fertilizers during the past year. Used alone it is only rarely that potash has shown any marked response, but when used with superphosphate very large increases have been recorded. No doubt the potash deficiency of the experimental areas has been accentuated by the repeated cutting and removal of the produce, but marked results have also been obtained on pastures used solely for grazing. The most striking responses have occurred in the Western District, but more recently good results have been recorded in parts of Gippsland. Where responses to potash have been recorded they have usually not been large in the first years, but unlike those obtained with phosphates and nitrogen have increased rather than diminished with repeated annual dressings. The results suggest that when a soil has become sufficiently depleted in potash to show a response, the depletion has reached a stage when liberal dressings of potash are required to overcome the deficiency and to re-invigorate the pasture.

The economy of the use of potash will remain uncertain until evidence as to the amount and frequency of the required application is obtained. Potash is expensive, and it is only where substantial improvement can be effected that its use can be justified. Potash is needed and

Manurial response Cobden plot, spring, 1939. Top, no manure; centre, super. 2 cwt. per acre; lower, super. 2 cwt. + potash 1 cwt. per acre.

should give very good results on responsive pastures in Victoria, but its indiscriminate use is to be strongly deprecated. The response to potash on these trials serves as a warning of the consequences of pasture mis-management rather than suggesting that a campaign of potash manuring should be undertaken. Every effort should be made to conserve the supply of potash in the soil and to guard against the development of a deficiency, the effect of which might prove expensive to overcome. During the past year trials were made on potash responsive land using "precipitator dust" obtained as a waste product in the manufacture of cement. This material contains from 9–11 per cent. potash (K_2O) which is readily available to the plants. Trials conducted with this material at a number of centres known to be potash deficient gave very good results during the past season.

Lime.

Generally the responses to lime have been poor, but on some trials on the red hill country of Gippsland good responses have been obtained. Most of the trials at North Mirboo have given good responses, but at Warragul the responses have been smaller and rather irregular. On the small grazing trial at Ellinbank, near Warragul, an excellent response has again been recorded where lime has been used with both superphosphate and sulphate of ammonia. This pasture had given a poor response to superphosphate alone, whilst it is known that neighbouring farms respond well to superphosphate only. Throughout the trials it has generally been recorded that where superphosphate alone gives a good response, lime will be of no benefit, but when the response to superphosphate is poor, lime is worthy of trial. Lime has been applied to Western District pastures which are known to be deficient in potash, but it does not appear to be of any use at all when potash is required.

At Kilmore, lime used alone, has effected a considerable improvement in the growth of the pasture, but on all other responsive plots, lime has only exerted a beneficial effect when used with superphosphate, and has not been found in any way to be a substitute for either phosphate or potash.

A "brand of lime" trial was established at Kilmore during the past year and this confirmed the earlier finding that where the pasture requires lime, any form of lime will be effective, providing it is of suitable physical texture.

Nitrogen.

The experiences of the last year have confirmed the earlier conclusions reached in respect to nitrogenous fertilizers. Quite marked responses can be obtained by the use of such fertilizers in the early spring, but they are of short duration, and are generally followed by a depressing effect on the subsequent growth. Repeated annual dressings have had very injurious effect on the swards. It is evident that Victorian soils are usually very short of nitrogen during the winter period, but it appears that this deficiency is better overcome by the encouragement of the clovers and the proper care of animal droppings, rather than the use of artificial nitrogenous fertilizers.

Kilmore pasture responds to lime. Note good growth of clover on narrow lime strip, in centre of picture.

On experimental pasture plots the use of nitrogen can quickly alter the composition of the sward, and obscure or prevent responses due to other fertilizers, and where sulphate of ammonia has been regularly used in conjunction with other fertilizer the ill-effect of the nitrogen had usually first to be overcome before a response to the other fertilizers could be obtained.

The results obtained with nitrogen on the Ellinbank plots stand in marked contrast to those obtained on all of the other experimental

areas. Here on grazing trials on impoverished pasture, excellent results have been obtained when sulphate of ammonia has been applied in addition to superphosphate and lime. No two of these fertilizers have given satisfactory results when used together, but excellent results have been obtained here when all three materials have been used.

Rock Phosphate and Blood and Bone Manure.

These fertilizers have been included in the Gippsland and Western District trials, but although they have given some response they have proved to be much inferior to superphosphate.

Pasture Mixtures and Strains Trials.

The year 1939 was one of abundant growth and those species which survived the previous severe drought responded strongly to the favourable conditions. Following the early autumn rains in the favoured areas the summer growing species Paspalum and Kikuyu grass, made unusually good growth. Subterranean clover responded quickly to the early rains and made unusually strong growth in the late autumn. On the lighter soils, and particularly in the hotter districts, the mortality amongst the perennial rye grass was found to be severe. Phalaris generally, had stood up to the dry period well, but there were instances in the north where even it, failed to survive. The perennial rye grass which survived the drought made very strong growth as a result of the accumulated fertility and the favourable weather, but towards the end of the season much of this growth lodged. Cocksfoot seemed to be crowded out by the strong growth of the winter growing species during this past period, and has since been less vigorous than usual. Considering the wet season, Yorkshire Fog was very inconspicuous during the year, it having been checked by the previous two dry years.

The newly-sown pasture species trial at Benalla made a very strong establishment in the autumn of 1939, while the re-sown pasture species trials at Wangaratta and Kiewa also made good development. The species sown on these plots are now well established and are showing very interesting contrasts.

The year has shown that pasture growth in this State is more dependent on soil fertility and available moisture than on the actual species present. Given favourable growing conditions volunteer species make rapid headway, but it is necessary that either these volunteer plants shall be of a desirable type or else useful vigorous species suited for the particular condition should be introduced. Unless vigorous, useful species which can take advantage of the improved fertility of the soil are present, then increasing the soil fertility may merely result in an increase in the proportion of cape weed, thistles, or marshmallows in the pasture. During the drought, the severe trampling and loosening of the soil in the homestead paddocks, and the dying out of much of the normally perennial grasses, provided cape weed with an excellent opportunity to establish and flourish during the following year, an opportunity which it availed itself of fully.

Results of Major Plots

GIPPSLAND AND WESTERN DISTRICT

The major plots were designed to determine the most suitable pasture species for use in the different district, the effect of the various artificial fertilizers on the growth and botanical composition of the pastures, and the value of "Intensive Rotational Grazing." On most of the trials in southern Victoria it has been found that subterranean clover and perennial rye grass are of outstanding value while cocksfoot phalaris and white clover may sometimes be useful. Other species have been found to be of value only under abnormal conditions. The grazing trials indicated that the accepted method of grazing paddocks in rotation, gives almost as high yields as the "Intensive Rotational Grazing" method, without the necessity for extra fencing and watering.

The seasonal growing period, as revealed by the measurements of growth on the various pasture plots throughout the year shows that there is a marked similarity in the period of growth of the different pastures in Southern Victoria. There is usually a complete cessation of growth during the summer and autumn period owing to drought, and in winter, growth is retarded by low temperatures and low soil fertility. The fertilizer trials have shown that growth can be greatly stimulated, providing soil moisture conditions are favourable and that responsive species are present in the pasture.

The present indications are therefore, that providing the pasture is of satisfactory botanical composition the most effective improvement

will be achieved by manurial treatment and the building up of soil fertility.

For this reason, after an examination of the results of the different sections of the major plots, it was considered that fertilizer treatment provided the best prospects for pasture improvement and accordingly work has been concentrated on the manurial sections of the major plots.

The major plot mowing areas were designed to measure the effect of fertilizer treatment on the pasture, both for total yield and seasonal production. Each mowing manurial trial is about ½ acre in area, and is divided into narrow strips 80 ft. long and 4 ft. 6 in. wide, there being six replications of each manurial treatment within each area.

Mowing one of the newer manurial pasture plots.

The plots were established on uniform areas of typical dairying pastures, which were levelled and prepared for cutting with a motor grass mower. Fertilizers have been evenly applied to the long narrow plot strips, and pasture cuttings are made at intervals throughout the year. The main manurial dressings are applied in the autumn, but early spring dressings of sulphate of ammonia and superphosphate are given to certain plots.

Two 20-in. wide strips are cut and weighed from each plot, the residual strips being later mown and discarded.

Large cutting cylinders were fitted to the motor mowers to enable them to cut grass long enough to provide suitable grazing for dairy cows.

In the early years, it was feared that repeated defoliation with low cutting mowers would result in abnormal swards being developed, in which rosette weeds and low-growing species would be prominent. In most cases, however, no alteration in the botanical composition of the sward can be attributed to the mechanical action of the mower. Where flat weeds, &c., have become prominent, their presence is usually due to the depletion of soil fertility, and they are not conspicuous where the plots receive sufficient potash to maintain vigorous growth.

Most of the older mowing manurial trials now show very striking responses to potash, and more recently the new North-East and Lilydale plots have shown significant responses to this fertilizer. Pastures growing on strong soils, containing a good proportion of clay, have maintained their production well, despite the continued removal of the produce from the plot area, but on the lighter soils, the mowing had not proceeded for long before very marked responses to potash were recorded.

The fertilizer requirements of Victorian soils are, therefore, not fixed and unvarying and related only to the origin of the soil, but are liable to vary greatly according to the previous management and treatment given the land.

MANURIAL TRIALS—GIPPSLAND.

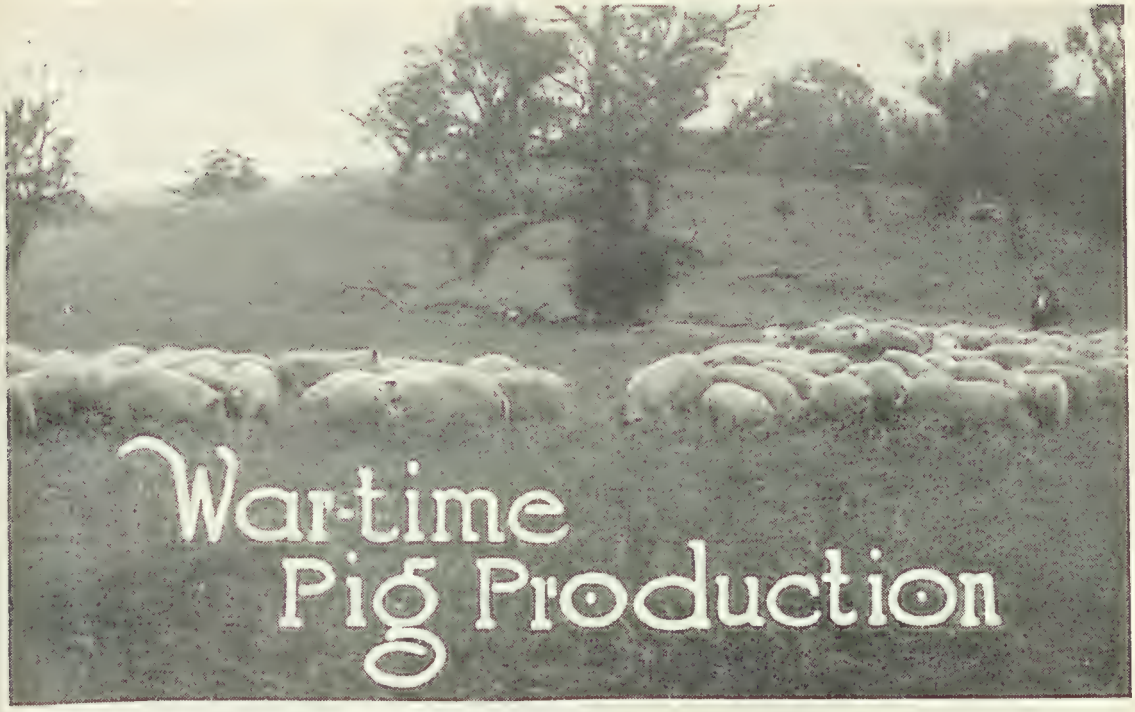
Caldermeade (J. Davis).

Mean Rainfall 30·5 *inches. Rainfall*, 1939, 41·1 *inches.*

The Caldermeade plot is situated on a deep fertile clay loam, the pasture consisting of perennial rye, subterranean and white clovers with Kentucky blue and some flat weed (*Hypochoeris*). The soil here is stronger than on most of the Gippsland flats and the district is noted for its good pastures.

This plot has always given a marked response to superphosphate and despite the repeated cutting and removal of produce has maintained its yield well. As might be expected under these circumstances the potash-treated plots have not shown much increase in growth. The yields during the past year were good but were no higher than those produced in less favourable earlier years.

[*Continued on page* 604.



Great Britain's Requirements

By L. A. Downey, H.D.A., Pig Expert

PIG production in Australia has increased rapidly during the last few years. With home consumption practically constant, the increased production has to be exported. About 90 per cent. of the pig meats exported from Australia go to the United Kingdom in the form of frozen pork of both porker and baconer weights. The remainder of the exports go to the Far East, the Pacific Islands, and to Egypt, mostly as cured bacon and hams.

The export trade with the United Kingdom has developed to such an extent (approximately 25 per cent. of the total production of Australia) that export value now governs local prices, which keep very close to export parity.

Since the commencement of the war pig meats, along with other meats, have been sold to Great Britain under contract with the British Ministry of Food. The second contract for the twelve months ending 30th September, 1941, provides for 7,000 tons of pig meats in the general contract for all meats, and a special quota for 24,000 tons of baconer weight pork. In the conditions of the contract, "porker" pigs are those weighing from 60 to 110 lb. dressed, and "baconer" pigs are those weighing from 111 to 180 lb. dressed, frozen weights.

The quantities of pig meats agreed to under the contract represent approximately 7,000 tons more than the quantity sold under the previous year's contract. While this is an increase of 29 per cent. on last year's exports, it is probably only about 7 per cent. increase on last year's total production in Australia. That our production is increasing rapidly is shown by the increase of total exports of pig meats from 14,000 tons in the year ending June, 1939, to 24,000 in the year ending June, 1940. The increase in pig breeding has been continued during the past twelve months, and all the progeny from recent increased matings have not yet been slaughtered, so it would appear on these statements that there will be more than sufficient pigs to meet the quota and supply the increase of 7,000 tons for the current contract.

In agreeing to the quota of 24,000 tons of baconer pork, the British Government urged the Commonwealth Government to make every

endeavour to see that this quantity was reached, and it is important, therefore, that the supply of baconer pigs should be sufficient to meet this commitment both for patriotic and business reasons.

Prices fixed under the contract are generally on the same level as those of last year's contract and should mean an average of about 6½d. per lb. to growers for prime pigs. The British Ministry of Food makes it very clear that over-fat pigs are not required, and a reduction of ¼d. per lb. is provided for second grade pigs. Grading will be based mainly on fatness, and excessively fat pigs will not be accepted for export. Consequently, it is important that pigs should be marketed in prime condition and before they become too fat.

While a rapid increase in production may be achieved by taking pigs to heavier bacon weights before slaughter, it is important to have pigs slaughtered when in correct condition, irrespective of their weight.

Potential Pig Supply.

The momentum already reached in pig breeding would appear to be sufficient to realize the quantity required for the current contract, but several factors are now operating which may seriously upset such an estimate.

During the past two years, dairy farmers, who produce the greatest proportion of pigs in Australia, have been purchasing fairly large quantities of grain and mill offals to augment their milk by-products and produce more pigs, but, because the prices of grain have risen and mill offals are in very short supply, these pig raisers are now reducing their pig production.

If, as is anticipated, there is a gradual change from butter to cheese and concentrated milk manufacture, there will be less milk by-products available for pig feeding. Also, the trend towards processing separated milk, butter-milk, and whey will further reduce the quantities available for pig feeding.

In view of the probable trend of the dairying industry, there is a necessity for stimulating production of pigs, using other sources of food supply.

The following are ways in which pig production may be maintained or increased:—

1. Dairy farmers raising pigs could supplement their supplies of milk by-products with root crops, forage crops, pasture, and pumpkins. These, fed in combination with milk and grain, are quite efficient pig foods, and an acre of mangels, yielding 16 tons, or an acre of pumpkins, yielding 8 tons, would produce food equivalent in value to that required to produce four bacon pigs of 140 lb. dressed weight. As such crops are available for feeding when the milk supply is low, they have added value as a supplementary food in maintaining a regular supply of pigs on the markets.

Some twelve months ago a committee inquiring into the disposal of effluents from dairy factories found that approximately 70,000 tons of whey (mostly casein whey) were being wasted. Whey has a value as a pig food when it is properly supplemented with concentrates and balanced with protein. Such factors as the wide fluctuation in seasonal supplies, cost of delivery from factory to piggery, and cost of supplementary foods reduce the net value of whey for pig feeding, but it is considered that in some cases such waste could be economically converted to pork.

2. Specialist pig farmers who established their businesses when grains were cheaper and mill offals were plentiful now find that the price of grain is too high in relation to the price of pigs, and are faced with a problem of finding cheaper foods. Various by-products, including kitchen waste, are being used, but in many cases such pig raisers could follow the plan suggested for dairy farmers, namely, the cultivation of root crops, pumpkins, forage crops, and pasture, to reduce their consumption of purchased concentrates.

3. Wheat growers who have supplies of wheat, barley, or oats could, with advantage to themselves and to the pig industry, market portion of their grains through pigs. The export price is such as to allow a fair margin of profit in such an undertaking when the grains fed to pigs are valued at the price they would realize if sold as grains. An estimate of production costs and probable returns shows a net return of 4s. 2d. per bushel for wheat, 3s. 6d. per bushel for barley, and 2s. 5d. per bushel for oats when fed on the farm where they are grown and used in the correct balance with protein-mineral supplements.

Such practice should not be looked upon as a means of disposing of a large part of wheat stocks, as the maximum consumption of wheat for each baconer pig of 140 lb. dressed weight is estimated at 12½ bushels.

4. Apple and pear growers, whose activities have been curtailed, might embark on small-scale pig raising with the objects of augmenting their incomes, disposing of unmarketable fruit, and providing animal manure for their

orchards. The use of pasture, forage crops, and purchased concentrates for supplementary feeding would be necessary in such a scheme.

5. Market gardeners could, in most cases, engage in pig raising with advantage, gaining some profit from feeding vegetable waste to pigs in conjunction with purchased concentrates, and also from the manure. It is estimated that the manurial return from pigs on current values is 14s. for each bacon pig of 200 lb. live weight produced; this does not include the important humus value of pig manure.

Increased pig production by wheat growers, orchardists, and market gardeners would necessitate an increased consumption of protein-rich concentrates for supplementary feeding. In Victoria, more meatmeal is produced than is used for local requirements, the surplus being exported to other States. Quantities of meatmeal suitable for animal feeding are used also as fertilizer. With re-adjustment within the trade, quantities of blood and bone fertilizer could be made available for animal feeding.

It is estimated that sufficient quantities of protein-rich concentrates could be made available to meet the anticipated increased demand. Protein-rich concentrates of vegetable origin, including peanut meal, linseed meal, rape-seed meal, and clover-seed meal, could be used to a greater extent in combination with the animal protein foods.

PIG RAISING ON WHEAT FARMS.

The following statement has been prepared as a guide to wheat-growers who contemplate embarking on pig raising. The figures shown as expenditure and income are only estimates, and many factors can affect the net returns.

Transport of pigs to selling centres will present some difficulty to pig raisers in the Wimmera and Mallee areas, but co-operative effort could overcome the difficulty to some extent.

Good pig markets, with both local and export buyers operating, exist at Ballarat, Newstead, Bendigo, Kerang, and Swan Hill. In the Northern District there are good pig markets at Shepparton, Kyabram, Wangaratta, Echuca, and Rochester.

As a side line on a wheat farm a herd of three sows and one boar is suggested as a satisfactory unit. The management of this number of pigs, with their progeny carried to bacon weight, would require approximately two man hours daily, which could probably be arranged without the employment of extra farm labour.

The practice of breeding and finishing pigs on the one farm is advocated in preference to buying pigs for fattening. This latter practice increases the risk of loss from disease and means gambling on markets.

The matings of pigs could be arranged for November and May, to allow farrowing and marketing of baconers in early autumn and spring to precede the peak-labour periods on wheat farms. The period elapsing between the mating of breeding pigs and marketing their progeny as baconers is approximately ten months.

Capital.

Stock.—Three selected grade sows, about 250 lb. live weight, at £6 each delivered, and one pure-bred Large White boar, about eight months old, at £11, delivered—£29.

Equipment.—Six acres are suggested as the minimum paddock area required. Four shelter sheds, a drafting yard and loading race, troughs, self-feeders, and waterers would be required. If completely new materials have to be purchased for this equipment, the approximate cost, excluding labour, would be £80. Where existing fencing can be used with little or no alteration, and where straw stacks, stables, or other material on hand can be used for equipment and automatic feeders and waterers are excluded, the cost may be reduced to £20 or less.

Foods.—If wheat, barley, and oat grains are available on the farm, and they can be ground or self-fed, some form of protein-mineral-vitamin supplement will be required. This may be in the form of separated milk with added minerals, in which case the produce of twelve cows would be required, assuming that each cow would provide 300 gallons of separated milk per year over the requirements of her calf. In the absence of separated milk a protein-mineral-vitamin concentrate mixture would be required; this would cost approximately £21 for the maintenance of the breeding herd for one year, and the raising of 42 pigs to 200 lb. live weight. Pasture, when available, should be used to the fullest extent, and it will effect a small saving in other foodstuffs. The quantity of grain consumed by the breeding herd for one year and for the production of 42 baconers to 200 lb. live weight is estimated at 525 bushels of wheat or 630 bushels of barley. Oats may be used to replace up to 25 per cent. of the wheat or barley.

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Detailed information on the subject of pig feeding and housing is available in free publications which may be obtained upon application to the Director of Agriculture, Treasury Gardens, Melbourne, C.2.

Probable Returns.

Sale of 42 baconers at 200 lb. live weight at current export parity = £3 16s. per head, or £159 12s.

Selling costs, estimated at 6s. per head—£12 12s.

Protein-mineral supplement—£21.

Depreciation on equipment, at 10 per cent. on the maximum outlay of £80—£8.

Interest on capital invested, at 5 per cent. on the maximum outlay of £130 for stock, equipment, and supplementary foods—£6 10s.

Total annual costs—£48 2s.

Net return for grain and labour—£111 10s.

£111 10s. for 525 bushels of wheat = 4s. 2d. per bushel.

£111 10s. for 630 bushels of barley = 3s. 6d. per bushel.

The relative value of oats when used up to 25 per cent. of the diet equals 2s. 5d. per bushel.

Mycotic Dermatitis of Sheep

By W. D. Shew, G.M.V.C., B.V.Sc., Senior Veterinary Officer

MYCOTIC dermatitis is due to an infection of the skin with a mould during early autumn. The resultant dermatitis, or inflammation of the skin, sets up an irritation causing excessive yolk secretion which mats together the wool fibres. In severe cases the skin itself becomes badly ulcerated, and if the ulcers coalesce large areas become denuded of wool, or the coagulated mass takes the form of horny-like growths. The usual condition is for the staple to take the form of pencils, the wool being commonly referred to as "pencilly wool."

The disease is definitely infectious and spreads through a flock, providing the conditions during the autumn are suitable. These conditions are those of warmth and moisture, but usually it is not until shearing takes place that the trouble is noticed. Affected sheep shear badly, as the blades or cutters will not go through the hard pencils.

A sheep affected with mycotic dermatitis. Note advanced state of lumpy wool all over the body. [Dept. Agric., S. Africa.

Treatment.

Treatment consists of dipping the sheep in a solution of 1 lb. of bluestone to 50 gallons of water. Some owners find that dipping in a bluestone solution may affect the wool. If desired, sulphate of zinc may be substituted for the bluestone (copper sulphate), the strength remaining the same; that is, 1 lb. of sulphate of zinc to each 50 gallons of water. This solution has been found to be just as effective for the treatment of mycotic dermatitis.

Badly affected sheep should be retained in a handy place and dipped a second or third time at intervals of a month. Extremely advanced cases are better destroyed. Despite the infectious nature of this complaint, the predisposing conditions are not always suitable season by season, and it is rare for any extensive outbreak to appear year after year.

A Profitable Dairy Farm

By Alex. Mess, Senior Dairy Supervisor, and J. Lancaster, Dairy Supervisor

EFFICIENT management is one of the essential requirements of dairy-farming, which is generally conceded to involve work of an exacting nature, calling for regular and sometimes long hours of work throughout the year. However, under modern conditions, dairying may be carried on with little or none of the drudgery at one time associated with the cow-yard, and the regular fortnightly cheque remains its most outstanding attraction.

Questions relating to the industry are frequently raised by persons who are contemplating taking up dairy-farming, and those most often asked are :—

Do you think I could make a living, dairy-farming ?

How many cows would I need ?

What size farm would I require?

The homestead of Mr. R. Spaull at Outtrim.

It will be apparent however, that the answer to these questions depends largely on the individual himself, on the amount of capital possessed, the approximate annual income aimed at, the quality of the cows forming his herd, and numerous other factors that will occur to the mind on giving the matter the amount of thought deserved by such an important project.

It will be readily appreciated, for instance, that 20 cows yielding 350 lb. of buter-fat per cow, would be far better business proposition than 35 cows, each yielding 200 lb. of butter-fat. The gross return, with butter-fat at the same price, per lb., in each case, would be the same, but with the additional costs of labour, feeding, &c., the net proceeds from the larger, poorer quality herd, would be considerably lower.

The area of land required depends, among other things, on the quality of the soil and the number of cows it is intended to run. The first-mentioned requirement is important, and should be borne in mind by those beginners who may be tempted to obtain the greatest possible acreage for their money, irrespective of the quality of the land. A farm of fifty acres that will carry 25 cows. costing the same money as a farm of 200 acres carrying the same number, is obviously a more profitable proposition.

Other important factors to be taken into account, are that the property is situated within a reasonable distance of a market, comprises good pasture land, and possesses an abundant water supply.

The expenditure of labour, manure, &c., on a small, good farm will be much less and give better results, than on a large farm of poor quality land.

An outstanding cause of low returns from dairy-farming and one which has been corrected by the most successful farmers, is the failure to provide at all times, a sufficient food supply. The disparity between the spring yield and that of other seasons, noted in many herds, is due largely to this cause. It is not the number of cows milked in the spring and early summer for some three months or so that should be taken into account, but the number

that can be well fed for the full twelve months. It is in this way only that the best results, measured in terms of the quantity of butter-fat per acre, can be obtained. In this regard many notable instances are on record. One of the most interesting is that of a cow, moved from a farm where this lesson had not been learned, to a farm where modern methods of feeeding and fodder conservation had been practised. The change resulted in a rise of 100 lb. in butter-fat yield for the year. Cows obtaining their Government Herd Test certificates with difficulty on one farm have been known to yield over 500 lb. of butter-fat on a well-managed property. It is well to bear in mind therefore that dairy farms are made profitable by the quantity and quality of their butter-fat yield. This may be secured largely by proper management and feeding, rather than by increasing the number of cows.

Meadow hay conserved for winter feeding.

A striking illustration of what can be done on a small farm may be seen on the property of Mr. R. Spaull at Outtrim, in the Korumburra district. Mr. Spaull came from Dargo, where he had gained experience in fattening cattle, sheep and pigs. During this time he had learned that the essential factor in fattening stock was to have on hand at all times a plentiful supply of good wholesome fodder. He found it took less to feed a fat animal than a poor one, and this knowledge has been put into practice on his Outtrim property. His answer to those who tell him he could carry more stock on his farm, has always been the same: "Yes—and make less."

On casual observation, Mr. Spaull's farm is quite ordinary in appearance. The sheds fences, buildings, &c., are similar to those of the average small farm. The area of the farm is small, comprising in all 56 acres, and is worked by Mr. Spaull and his wife. They have milked 24 cows only until this year, when another was added to that number, and yet, for the past three years the property has

Milking sheds and dairy buildings.

Cow-bails showing well-drained concrete floor.

returned over £10 per acre, with a possibility that this satisfactory yield will be increased in the future.

A permanent water supply is provided by a creek running through portion of the property, which is subdivided in a manner different from that usually followed. There is one large paddock of approximately 28 acres, and several smaller ones, containing from two to four acres each. During the period of the year when there is a rapid growth of grass the cows remain in the large paddock, but during the remainder of the year the small paddocks are used. The cows are turned into a small paddock for about three hours a day, usually for three days, then into another of the small reserved areas for a similar period, and so on. The cows spend the rest of the day in the large paddock through which the creek runs. From about June, the milking cows are fed grass-hay chaff in the bails for about three or four months. Grass-hay is fed to the dry cows in the paddock, but no concentrates are used, Mr. Spaull relying on pasture and grass-hay, which he cuts and stores in the spring.

The return from this well-conducted farm for the last financial year, shown from the actual quantity of butter-fat paid for by the Korumburra Butter Factory was 7,842 lb., and the amount paid to Mr. Spaull was £508 14s. 3d., plus a deferred payment of £16 16s. 10d., making a total for butter-fat alone of £525 11s. 1d. The full statement of revenue and expenditure for the year is as set out hereunder:—

Expenditure.

	£	*s.*	*d.*
Wages	13	0	0
3 tons super.	9	0	0
Pollard	5	0	0
Total	27	0	0

Receipts.

	£	*s.*	*d.*
Payment for butter-fat ..	525	11	1
Sale of pigs	70	11	6
Total	596	2	7
Less Expenditure ..	27	0	0
Net Return ..	569	2	7

To this return the value of house rent, firewood, water, milk, vegetables and fruit, could be added. These, no doubt, would be worth at least £80 per year. Taking this figure as reasonable, the total return from the farm would be equal to £649 2s. 7d.

The returns per cow for butter-fat are slightly in excess of £21, while the net return per cow for pigs would be approximately £2 16s. The return of butter-fat per acre is 140 lb.

Mr. Spaull usually rears five poddies each year, and a recent count of stock disclosed that the farm was carrying 25 milkers, 4 springers, 3 poddies, and 1 draught horse.

The milking herd has not been tested or culled, but each cow has been milk-tested at the Korumburra Butter Factory. It is Mr. Spaull's intention later to test his cows, and he may possibly do even better than at present, although it would appear from the returns obtained that there are few, if any culls in the herd. A contributory factor to his success is due no doubt to Mr. Spaull's avoidance of over-stocking.

The pastures are composed of rye-grass, white dutch clover, crested dogs-tail, a little strawberry clover and paspalum which remains green during a normal summer. Superphosphate at the rate of 1 cwt. per acre is used annually. One ton of hay per cow is stacked for use each year.

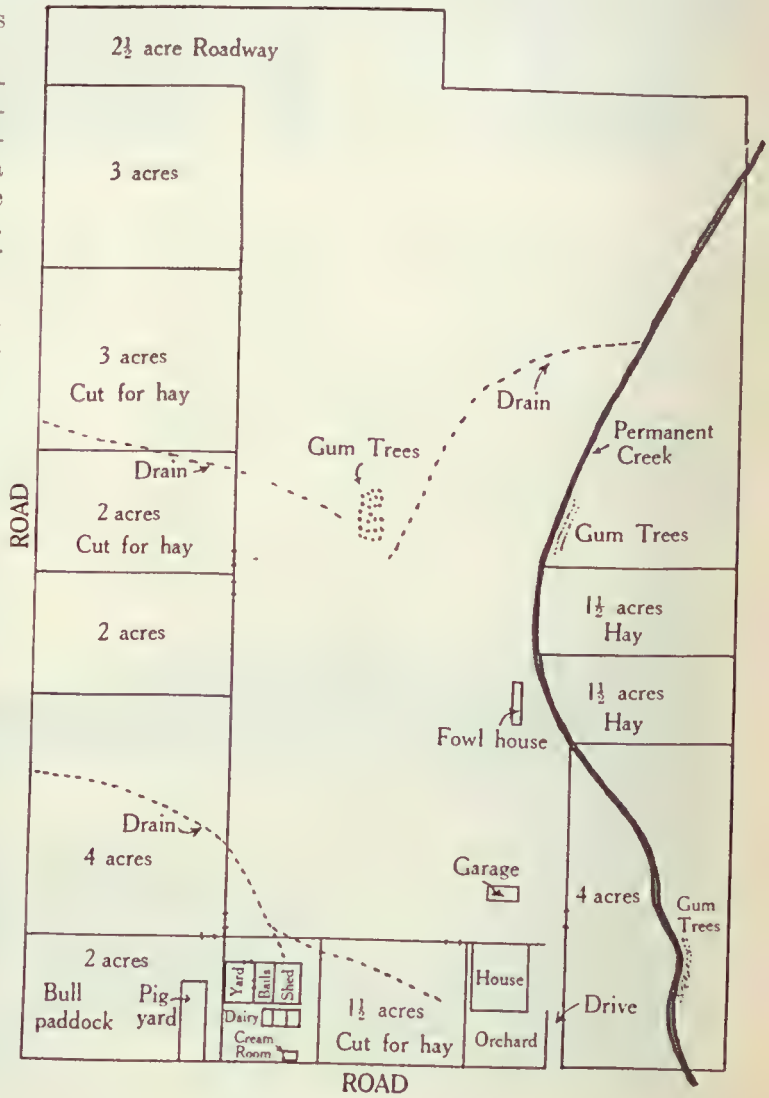
A value of £12 per head is placed on his herd by Mr. Spaull. The animals are always kept in good condition, particular attention being paid to the teeth. At the first sign of deterioration here, the cow is sold, the money received going towards the cost of rearing a heifer to replace the culled animal.

Additional income received from the sale of heifers, calves, and eggs not required on the farm goes to Mrs. Spaull, and is not included in the general income from the farm referred to previously.

Visitors to this interesting property are always impressed at the quiet, unobtrusive way in which the work is carried on. The farm buildings have been so placed to allow the work to be performed with a minimum of waste time. The buildings are constructed in such a manner as to facilitate efficient and rapid cleaning. These structures are not expensive. The cow-shed is built of galvanized iron, with a well-drained concrete floor. The separator, engine, and wash rooms are of the same material with gable roofs. The walls are built on a 1 ft. high brick foundation. A clear air-space has been provided between the separator room and the bails to promote a pure atmosphere in the separator room.

Electrically driven plant operates the milking machines and separator, The washing equipment includes a steam boiler, wash-trough, brushes, soda and racks. The vat stand and racks are covered with flat galvanized iron for rapid and effective cleaning. Machines are dismantled twice daily, the rubbers, teat cups, releaser &c., being cleansed in the wash-trough, and then, together with the whole plant, sterilized by the steam boiler.

These measures for ensuring a maximum of cleanliness in the dairy are, without doubt, the reason for the high quality of the cream



Plan showing subdivision of Mr. Spaull's farm.

supplied by Mr. Spaull to the Korumburra Butter Factory.

Immediately after separating is finished, the cream is removed to a detached cream room, which is situated near the road fence. A trap door from the cream-room gives access to a covered stand from which the cream is collected by the butter-factory wagon. It will be realized, therefore, that the cream is at no time left exposed to the rays of the sun, and also cannot be interfered with by dogs and other animals.

In addition to its other interesting features, the farm is remarkable in that it is the depository of coal from the creek at flood times, the mineral being carried from an old mining area. The coal is collected in summer time, and provides an unusual and cheap source of fuel.

Roadside cream-room showing covered platform at right.

The Sheep Ked

STUDIES on the sheep tick (or ked) and its control have been continued at the McMaster Animal Health Laboratory of the Council for Scientific and Industrial Research. The results of these investigations will be published shortly, but to save delay in making them available to officers of the State Departments of Agriculture, and through them to the farming community, an advance circular has been prepared. The information given hereunder has been extracted from this circular.

The investigations have revealed that the adult female tick lives for about 100 days, and the male for about 80 days. The mature female gives birth to a pupa contained in a pupal case, and from this the adult emerges in about 22 days. The pupal case is attached to the wool by a sticky substance secreted by the female, and is popularly known as the "tick egg." The young tick shows a preference for the lower parts of the sheep's body.

Several important practical implications of the work are summarized below:—

(1) Younger sheep and those in poor condition (as a result of worms for example) are more likely to be infested.

(2) The chance of clean sheep becoming affected from their surroundings is remote, as ticks cannot live away from a sheep for more than a few days.

(3) The pupae ("tick eggs") are attached to the wool at some distance from the skin, and, therefore, with special care they could be removed, together with most adult ticks at shearing. One dipping *immediately after shearing* in a non-arsenical (to avoid the possibility of arsenical poisoning by way of shearing cuts) dip should then eradicate this parasite from a flock if given before any remaining female ticks have time to give birth to young ticks. However, weather conditions may prevent this. If some "tick eggs" remain on ticky sheep after shearing—as they usually do—two dippings will be required to make reasonably sure of eradication. An interval of from 20 to 21 days between dippings offers the best chance of success.

(4) Doubt has been cast on the efficacy of postponing dipping for several weeks after the shearing so that the longer wool will retain the dip, and thus kill the ticks that emerge from pupae later.

Work is being done also in testing the value of the different chemicals used in dipping fluids.

It is proposed in the near future to put as many of these points as possible to practical test under field conditions.

Pasture Improvement Competition

Coleraine District Awards

Report of the Judge, F. R. Drake, B.Agr.Sc., Assistant Agrostologist

IN judging pasture improvement competitions difficulty is always experienced in comparing entries on high fertility country with entries on lighter land. If the fields are judged solely on their merits as they stand, the better country has usually, but not always, a decided advantage. If, on the other hand, judging is based on the degree of improvement effected over natural conditions, as was suggested in the present case, the light land has an advantage in that it usually affords wider scope for improvement. It was decided to combine both systems of judging and to allot a maximum of 100 points for the quality of the pasture and a maximum of 50 points for improvement.

A further complication is introduced by the fact that in many cases it is difficult to visualize the original condition of the country. In this competition the degree of improvement effected was judged by comparison with nearby native grass pastures on similar country, not recently cultivated, top-dressed, or seeded.

Points allotted to competitors were based on the following scale:—

	Points.
Botanical composition of pasture ..	35
Denseness	15
Management	25
Uniformity and general appearance	15
Freedom from weeds	10
Improvement	50
Total	150

Most emphasis is laid on the composition and denseness of the pasture and on its management. One looks for a well-balanced mixture of permanent grasses and clovers, dense and in the fairly short, leafy condition most suitable for grazing. A mistake commonly made by farmers is to so manage their entry for a competition that at judging time it is in too forward a condition, past the stage when most suitable for grazing and more nearly approaching the hay stage.

In the competition conducted by the Coleraine Pastoral and Agricultural Society, all fields were affected by the very unfavourable seasonal conditions prevailing. In all fields the permanent grasses, mainly rye-grass and the native wallaby grasses, lacked vigour, and the less desirable annual grasses such as goose grass, hair grass, and barley grass, were in ear and more conspicuous than usual. Clover growth was restricted in most cases and the composition score of some entries had to be heavily marked down because of the relative absence of clovers.

Adverse conditions limited the number of entries, only five fields being submitted for judging, and to these, points were allotted as detailed hereunder:—

—	Composition.	Denseness.	Management.	Uniformity and General Appearance.	Freedom from Weeds.	Improvement.	Total.
Mr. M. Bunge	30	13	23	13	9	40	128
Mr. J. Lyon ..	28	13	20	12	9	25	107
Mr. H. Lyon..	26	14	20	12	9	20	101
Mr. J. Francis	25	10	16	8	9	25	93
Mr. D. Cameron	10	5	20	10	6	15	66

The winner, Mr. M. Bunge, is to be congratulated on showing a field of attractive appearance in very strong contrast to the unimproved pastures nearby. The field consists of a good cover of subterranean clover, with good leafy plants of perennial rye grass present, but not dense, and scattered plants of wallaby grass, together forming a uniform sward well and evenly grazed. The field also contained a good deal of goose grass and hair grass coming into ear, and would have scored higher with more rye grass and less of these annual grasses.

The entries placed second and third were both good mixed pastures, perhaps rather deficient in clovers, more as a result of seasonal conditions than for any other reason. Both contained rather a lot of annual grasses, the field placed second being very closely grazed, while the field placed third carried a good deal of growth and was somewhat uneven and rough in parts.

By A. C. T. Hewitt, M.Agr.Sc., Livestock Science Officer

Principles of Feeding.

IN any discussion of the principles of feeding, some simplification of the problem frequently is sought by comparing the animal with the locomotive. The food requirements of the animal have functions to perform similar to those of the fuel, oil, and new parts in the machine. But there are differences. One is that when the supply of fuel runs out the engine stops, but the animal is able to keep going for some time by using energy stored in its own body, although this is detrimental to its subsequent efficiency. Foods are made up of many compounds such as the proteins, fats or oils, carbohydrates both soluble and fibrous, minerals and vitamins, and greater or lesser amounts of these compounds are digestible nutrients.

The starch equivalent and the protein equivalent are two relatively new terms that have been introduced to simplify feeding problems. The starch equivalent (S.E.) represents the amount of productive energy—that is, the amount of energy available for the production of wool, fat, growth, unborn lambs, or milk—which the sheep is able to assimilate from a food. It is much simpler to value oaten chaff or hay on the basis that it contains 42 lb. of starch equivalent than to say that it contains 3.7 lb. of digestible protein, 1.8 lb. of digestible fat, 14.2 lb. of digestible fibre, and 31.9 lb. of digestible carbohydrate. The protein equivalent (P.E.), as the term implies, represents the protein value of a food.

When working in starch and protein equivalents, one has not to bother about any other components, and it makes calculations simple. Under older systems of determining food values, digestible proteins, fats, fibres, and soluble carbohydrates had to be taken into consideration, while the fats, and perhaps the proteins, had to be multiplied by certain factors and additions made, before the food value of the fodders could be ascertained.

The starch and protein equivalents are simple expressions of the value of a fodder and have been calculated from actual feeding experiments in other parts of the world. The nutritive ratio is worked out simply by dividing the protein equivalent into the starch equivalent. A balanced ration for lambing ewes and young lambs is one in which the starch equiva-

lent is five times the protein equivalent. In balanced rations for store and fattening sheep the starch equivalent is six to ten times the protein equivalent.

Appetite.

The amount of dry matter in a fodder is of importance when feeding bulky fodders with a low food value. The appetite of a sheep is governed by the amount of dry matter that it can eat and is definitely limited to about 2 or 2½ lb. per day for ordinary dry sheep and up to 3 or 3½ lb. for ewe suckling lambs.

The animal stops feeding when the appetite is satisfied, irrespective of whether it has consumed sufficient nutrients or not. When insufficient dry matter is eaten, sheep tend to continue looking for more feed and rest only when tired or after the appetite is satisfied.

The appetite is stimulated by many factors, such as palatability of the foods, exercise, condition and health of the sheep, temperature, and water supply. The suckling of lambs stimulates the appetites of ewes.

Vitamins.

In Victoria, where sheep have access to pasture and other green feed or receive sufficient fresh fodder, deficiency of vitamins should never occur.

Minerals.

With the exception of common salt (sodium chloride), all the minerals required by sheep are usually present in the natural food supply in sufficient quantity for the well being of the animal. In a number of districts sufficient common salt is present in the water supply, but otherwise a salt lick should be made available, when the sheep should be allowed approximately ¼ oz. per head daily or between 4 and 5 lb. per head per year. The salt stimulates the appetite and aids the digestion of the food, so that sheep receiving it do better, fatten more quickly, and grow more wool.

Cereal grains, such as oats, wheat, and barley, and concentrates, such as linseed nuts, are deficient in lime, so that when sheep are fed on these compounds, powdered chalk, ground limestone, or slaked lime should be mixed with the salt lick. To make such a combined lick, between 20 and 50 per cent. of lime can be added to the salt, or one bag of lime can be mixed with two bags of salt.

Recent work conducted by the Council for Scientific and Industrial Research has indicated that phosphate deficiency in sheep is practically non-existent in Victoria. While the top-dressing of pastures and the manuring of crops with superphosphate is recognized as the most economical means of correcting any possible phosphate deficiency, bone meal or bone flour can do no harm in the lick except that it is an unnecessary expense and makes the lick less palatable. On a farm where no superphosphate is used, it may be advisable to add 20 per cent. of bone meal or bone flour to the salt.

Except in a very few isolated areas, other minerals are not required by sheep. Farmers who suspect the deficiency of other minerals such as iodine, copper, cobalt, iron, &c., are strongly advised to seek advice from the Department of Agriculture before purchasing or using them.

Pasturage and Home Grown Crops.

Pastures supply the bulk of stock foods in Victoria, and their value is inestimable. Without pasture, the wool, mutton, fat lamb, and even beef and dairying industries would be unprofitable, and, therefore, in all general cases, hand feeding must be considered as supplementary to pasturage. Pasturage is the cheapest of animal fodders, and, when properly managed, one of the most nutritious.

As a result of improved pasture management the number of stock carried on farms is being continually increased therefore losses through inadequate pasturage are apt to become more serious during lean seasons or periods of drought. These losses can be reduced to a minimum by supplementary hand feeding, which is becoming more important in Victoria each year.

Under irrigation, where pastures should not be affected by hot, dry weather, green succulent herbage should be available all the year round. Such herbage has a nutritive ratio of about 1 : 2.5, and, in the winter months when supplementary hand feeding is necessary to carry the full spring, summer, and autumn quotas of stock, practically any fodder can be utilized. In many parts of southern and eastern Victoria pastures compare favourably, for the greater portion of the year, with those under irrigation. Supplementary hand feeding on such pasture is relatively simple, except, perhaps, in the late summer after the grass has dried off, when a fodder, such as clover or lucerne hay or linseed nuts, which are rich in protein, should be fed.

One of the cheapest and best supplementary fodders for sheep is grass hay, conserved on the farm from surplus grass harvested in the flush of the season. Silage made from surplus pasture is also a good fodder. The nutritive value of both products is determined by the stage at which the pasture is cut, the kind of weather at harvesting, the time allowed to cure, &c. Good quality pasture hay and silage have better feeding values than oaten hay or silage, but should they be allowed to deteriorate while being harvested or in the stack, their food values will be decreased and they may even become useless as fodders.

To produce the very best grass hay, the grass should be cut green as soon as the pollen begins to show from the flowers, raked into windrows and cocked before the sun bleaches out the green colour, and stacked or baled as soon as it is dry enough not to heat. While in the field, each shower of rain reduces the food value of the hay, and, when rain penetrates the cocks, the hay further deteriorates due to the rain itself and the extra handling necessary to re-cock the hay for drying purposes. The new cocks will not be as weatherproof as the originals, and more green surfaces will be exposed for bleaching. Deterioration in the stack is usually caused by moisture. When on faulty foundations, moisture may creep up from the ground, or, if the stack is badly built and does not shed the rain, moisture will penetrate from above and rot the hay. In a badly tied stack, wind may do damage by blowing off hay.

Where lucerne hay can be grown, sufficient should always be conserved for supplementary feeding, as it is one of the best fodders for sheep.

Oats, barley, and rape are commonly grown for green feed in the late autumn and early winter, while maize, millet, and sorghum are grown for green feed in late summer and early autumn. All these green fodders make excellent substitutes for pasturage.

The growth of green fodder crops and the conservation of hay and, perhaps, silage, are the most economical means of preparing for the unfavorable seasons of the year.

Purchaseable Fodders.

Roughage, in the form of hay or chaff, and concentrates, in the form of grain or nuts, are the fodders usually purchased for supplementary feeding. The purchase price not only includes the original price paid to the farmer who produced the fodders, but also transport and cartage charges, chaffing and milling costs, commissions, and the "middle men's" profits. When these products are home grown, these latter charges, which usually amount to at least half as much as the original price paid for the produce, are saved.

Supplementary Rations.

When making up rations for sheep, the feeder has to use his discretion and adjust the rations in accordance with the amount and nature of the pasture available, the season, the condition of the stock, the purpose for which the stock are fed, the nature of the available foods, and the market value of any food to be bought.

A simple, home-made self feeder for sheep.

Most hand feeding is supplementary to pasturage. When it is green and succulent, and supplying a large portion of the total requirements of the sheep, the pasture can be supplemented with foods containing a low protein equivalent, such as hay, silage, and grain. Where the pastures become dry or are drying off, some protein-rich supplementary food becomes necessary, especially for lambing ewes. Lucerne hay, linseed nuts, and nuts containing blood and meat meals are the usual protein-rich supplements.

Food Requirements of Sheep.

Each year in Victoria more and more sheep are receiving supplementary hand-feed during the months when pasturage is scarce. On larger sheep farms very little home grown fodder is conserved, and the principal supplementary hand-feeds are oats and linseed meal nuts. These concentrates are preferred to roughages, because not only are they readily eaten by the sheep without waste, when, as is usual, they are spread on the ground, but also the freight

Weighing the Sheep in Hand-feeding Experiments.

and cartage costs are less, and a minimum amount of labour is involved in feeding them out.

Top-dressing, rotational grazing, better utilization of the pasturage in the flush season, and irrigation, are some of the more modern practices employed to increase the carrying capacity of farms. Cases are on record where the carrying capacity has been increased twelve times what it was prior to the introduction of improved methods. Under these conditions, supplementary hand-feeding in lean seasons becomes essential.

It is customary for ewes to lamb during the winter which, south of the divide, usually is the leanest period of the year. Fewer losses of ewes and lambs, quicker maturing lambs, heavier fleeces from the ewes, and better conditioned ewes are a few of the advantages due to supplementary hand-feeding.

The total food requirements of sheep vary considerably, and it is still controversial as to what a sheep really requires, since research workers continually get very divergent results.

At the State Research Farm, Werribee, in 1926, J. E. Thomas maintained wethers (80–85 lb. live weight) on as little as 3 oz. linseed nuts, plus 1½ lb. oaten straw per wether per day. This represents a maintenance requirement of less than 4 lb. starch equivalent per sheep (100 lb. live weight) per week. Later, during 1931-32, in experiments relating to the rotational grazing of irrigated pasture, Messrs. E. T. Beruldsen and A. Morgan showed that ewe weaners averaging 64 lb. live weight at the beginning of the trials consumed an average daily ration of 7·8 lb. succulent irrigated pasture per head per day and increased in weight to 113 lb. at the end of the trials, twelve months later. This ration included maintenance, growth, and some fattening, and is equivalent to a ration containing approximately 7 lb. starch equivalent per sheep (100 lb. live weight) per week.

From the work of Thomas, and Beruldsen and Morgan, the feeding standards of sheep used by the British Ministry of Agriculture, and based on experiments conducted at the School of Agriculture, Cambridge, appear to be too high (9 lb. starch equivalent per 100 lb. live weight per week for maintenance). The feeding standards given by Professor J. A. S. Watson from experiments conducted at the School of Rural Economy, Oxford, are more applicable to Australian conditions.

Table 1 shows the food requirements of young sheep per 100 lb. live weight for growth and fattening as given by Watson and for maintenance as calculated from work by Thomas.

TABLE 1.—THE FOOD REQUIREMENTS OF SHEEP PER 100 LB. LIVE WEIGHT.

—	Starch Equivalent per Week.
	lb.
Maintenance (only)	4·0
Normal growth (¾ lb. per week) ..	6·5
Slow fattening (1¼ lb. per week) ..	9·7
Full fattening (2¼ lb. per week) ..	12·9
Intensive fattening (2¾ lb. per week) ..	15·0

Nutritive Ratio—from 1:5 to 1:7.

From recent Australian research it is believed that the protein requirement of sheep is considerably greater than that allowed by the English (Cambridge) standards — 0.38 lb. protein equivalent per week for maintenance.

Wool is a pure form of protein, and, for maintenance and normal wool growth approximately ¾ lb. protein equivalent per sheep (100 lb. live weight) per week is required.

Breeding ewes will require more than an ordinary maintenance ration because additional nutrients are required for the growth of the unborn lambs. During pregnancy, ewes will require as much food as is necessary for normal growth (see Table 1). Breeding ewes also require additional protein to stimulate a good milk flow, and green forage is also a great benefit to them. There should be at least one part of protein for each five parts of starch equivalent in their rations.

Ewes rearing lambs for the fat lamb market will require as much food as is supplied by a full fattening ration, while ewes rearing ordinary lambs will require a slow fattening ration. When computing rations for ewes with lambs, the weights of the lambs must also be considered and added to the weight of the ewes. Thus, a ewe weighing 75 lb. with a lamb weighing 25 lb. will require the same amount of food as a sheep weighing 100 lb. on the full or slow fattening ration. The nutritive ratio of the rations for ewes rearing lambs should not be wider than 1:5.

By using Table 1, the maintenance rations for sheep during lean seasons could be supplied by 1½ lb. oaten or lucerne chaff or grass hay, 1 lb. oats, or ¾ lb. wheat or linseed meal nuts. Nevertheless, it is seldom necessary to feed more than a small portion of the full ration, as pickings are usually available and, to encourage sheep to graze scant pastures to the fullest extent, the necessary supplementary rations should be slightly under estimated. The amount to be fed can be left to the discretion of the owner, who should closely observe the condition of his flock.

In connexion with the feeding of wheat to sheep, 4 to 5 oz. per sheep per day has been found to be sufficient for dry sheep in paddocks where there is some roughage. During the first week, commence by giving 1½ oz. per head daily for the first two days and then increase the amount by ½ oz. per day until the full amount that it is intended to feed is reached. Any trouble caused by feeding sheep on wheat usually occurs during the first week, when some apparently eat too much before they are used to it.

The wheat should be scattered thinly and quickly on the ground so that all the sheep can feed at once. An excellent idea is to tip the wheat into the box of a truck or cart and spread it on the ground through a tube or hose inserted into the bottom of the box, as the vehicle is driven in circles round the flock until the ration for that particular paddock has been given. If the paddocks become bare, up to ½ lb. of hay should be fed to take the place of natural roughage. Many sheep owners have successfully fed wheat in this way for long periods, and assert that once the sheep have become used to it no amount seems to harm them. Oats, maize, and other grain, as well as sheep nuts or cubes can be similarly fed through a hose from the truck or cart.

The conservation of surplus grass in the form of hay or silage and the growth of early winter crops of oats or barley for grazing off are economical means of supplementary feeding.

Sheep Feeding Tests.

State Research Farm, Werribee, 1926.—In 1926, Mr. J. E. Thomas, B.Sc., B.Agr.Sc., B.V.Sc., Ph.C., in consultation with the sheep and wool expert (Mr. N. A. Bowman), conducted feeding experiments with sheep at the State Research Farm, Werribee, to determine the suitability of feeding certain common fodders and the quantities required for the maintenance of dry sheep without any grazing. This information was necessary as a basis for computing maintenance rations for dry sheep during droughts and other lean seasons of the year.

The carrying capacity of a sheep farm is determined more by the number of sheep that it will maintain during a very dry summer or a severe winter following a bad autumn, than by the number it will carry in peak seasons. From these experiments information as to how the carrying capacity of farms could be profitably maintained at a constant level throughout the whole year and during droughts, was obtained.

For the tests, 60 comeback wethers, rising four-tooth, averaging 85 lb. live weight, Riverina bred and August shorn, were ear-tagged and divided into three groups, A. B, and C. Three paddocks, each 1 acre in area, grazed bare, fenced off and provided with feeding troughs, a straw rack, a water supply, salt lick, and shelters, were used to hold the sheep during the experiments, which commenced on the 21st April and expired on the 14th October, 1926.

The sheep were fed rations which were commonly used and readily obtainable in Victoria, and, with the exception of linseed nuts, could be grown, harvested, and conserved on most farms. They included very good quality Algerian oat straw (which contained some grain), Algerian oats, oaten silage, mixed wheaten and oaten (shandy) chaff, lucerne hay, and linseed nuts. From these fodders six different rations were made up. Where straw was fed, more was given than the sheep could eat and that uneaten was weighed out. With the other fodders a definite quantity, less than the appetite or capacity of the sheep, was fed and, therefore, all was eaten. Meadow hay was not included because very little was conserved in those days.

The health of the sheep in the various groups was uniformly good throughout with the exception that one sheep, receiving straw only, died from faulty nutrition and another receiving straw and oats died from natural causes. The animals in the pen receiving lucerne hay and straw looked particularly well at all times. The dry feeds did not cause any apparent digestive troubles.

At the end of the experiments the wool was certainly light conditioned, but was well grown and sound, but, for four weeks before shearing, the sheep were run on good pasture. They cut an average of 10 lb. of wool per sheep.

In Table 2, the rations fed to each group of sheep are shown. For group A, experiment 1, the sheep were fed as much straw as they would eat, which at first was nearly 1¾ lb. each daily, but after 69 days, through loss of appetite, consumption fell to 1⅛ lb. By this time the sheep had lost 7 lb. weight and one had died, so the ration (experiment 2) was supplemented by feeding 4 oz. of linseed nuts to each sheep daily. With 4 oz. of linseed nuts the sheep gained live weight rapidly, so the nuts were reduced to 3 oz. and gains continued, but a loss of weight resulted when the nuts were reduced to 2 oz.

TABLE 2.—SHEEP FEEDING TESTS, STATE RESEARCH FARM, 1926.

Number of Experiment.	Fodder.	Average Amount Consumed Daily per Sheep.	Length of Test.	Average Live-weight of Sheep.		Gain or Loss in Live-weight.
				At Beginning.	At End.	
			Days.	lb.	lb.	lb.
A. 1. ..	Oaten Straw*	1·71—1·13 lb.† ..	69	88·4	81·4	− 7·0
2. (a)	Oaten Straw	1·37—1·42 lb. ..	51	81·4	89·4	+ 8·0
	Linseed Nuts	4 oz.				
(b)	Oaten Straw	1·44—0·80 lb. ..	44	89·4	94·0	+ 4·6
	Linseed Nuts	3 oz.				
(c)	Oaten Straw	1·16 lb.	12	94·0	91·6	− 2·4
	Linseed Nuts	2 oz.				
B. 3. (a)	Oaten Straw	1·00—0·72—1·18 lb. ..	86	87·8	88·7	+ 0·9
	Lucerne Hay	8 oz.				
(b)	Oaten Straw	1·08 lb.	14	88·7	89·3	+ 0·6
	Lucerne Hay	12 oz.				
5 ..	Wheaten and Oaten Chaff	1·5 lb.	76	89·3	94·9	+ 5·6
C. 4. (a)	Oaten Straw	1·50—0·65—1·02 lb. ..	72	83·1	81·5	− 2·1
	Oats	6 oz.				
(b)	Oaten Straw‡	0·78—0·68 lb. ..	40	81·5	81·1	− 0·5
	Oats	8 oz.				
6. (a) ..	Oaten Silage	3·0 lb.	52	81·1	88·4	+ 7·3
(b) ..	Oaten Silage	2·0 lb.	12	88·4	87·2	− 1·2

* One sheep died from faulty nutrition.
† The amount of straw consumed was between these figures from the beginning to the end of the test respectively.
‡ One sheep died from natural causes.

The sheep in group B, experiment 3, maintained their live weight on rations containing approximately 1 lb. of straw and ½ to ¾ lb. of lucerne hay, and gained weight in experiment 5 when the rations were changed to 1½ lb. of shandy chaff.

The sheep in group C lost weight on rations of straw and 6 to 8 oz. of oats (experiment 4), but gained rapidly on 3 lb. of oaten silage (experiment 6). Two pounds of oaten silage was apparently insufficient to maintain the sheep.

From these experiments, Thomas concluded that dry sheep weighing 80 to 90 lb. live weight could be maintained on the rations shown in Table 3. In this table the costs of these rations based on Melbourne prices on 31st May, 1940, are also shown.

TABLE 3.—RATIONS, WITH COSTS, FOR MAINTAINING CROSSBRED WETHERS 80 TO 90 LB. LIVE WEIGHT.

Daily Ration.	Price Melbourne, 31st May, 1940.	Cost of Ration per Sheep per Week.
Oaten Straw, 1 lb. ..	£2 10s. per ton	4d.
Oats, 9 oz.	1s. 9½d. per bush.	
Oaten Straw, 1¼ lb. ..	.. ..	4¼d.
Lucerne Hay, ½ lb. ..	£5 per ton ..	
Oaten Straw, 1½ lb. ..	.. ..	4¾d.
Linseed Nuts, 3 oz. ..	£12 per 2,000 lb.	
Oaten Silage, 2½ lb. ..	£1 per ton ..	2d.
Shandy Chaff, 1½ lb.	£4 per ton ..	4½d.

The nutrients supplied by the rations in Thomas's experiments, with the exception of oaten silage, are approximately equal to the requirements for the maintenance of sheep shown in Table 1. Generally, the results obtained by feeding sheep on rations composed entirely of silage have not been as satisfactory as those indicated here, although, elsewhere, along with other feeds, good results have been recorded. The quality of the oaten silage made at the State Research Farm, Werribee, has always been very good, and differs from most silage in that the oats are cut only about one week earlier than they would have been if left and cut for hay. When cut for silage the oat heads are fully developed and the grain is in the milky stage. Nevertheless, when fed to dairy cattle, similar silage has not shown such a high food value.

Silage has several advantages over other fodders. It is free from the ravages of mice, weevils, and other pests. It can be made in weather unsuitable for hay making, and it can be made from crops, such as maize and sorghums, and a number of weeds, which make luxuriant growth but do not make satisfactory hay. Some silages have a very high acid content and, in Europe, better feeding results have been obtained by neutralizing the acid with lime before the silage is fed. On account of the large quantity of moisture in silage, more labour is required to handle it, and it can only be satisfactorily fed on the property and near where it is produced.

Experiments Conducted by the Council for Scientific and Industrial Research at the Animal Nutrition Laboratory, Adelaide, 1939.—Following the 1939 drought and the accompanying low prices for wheat, the Council for Scientific and Industrial Research conducted a short trial with wool-producing sheep by dividing 20 ewes into four groups of five and feeding them on rations per head per day approximately as follows:—

Group 1.—Wheat, 17 oz.; straw, 5 oz.
Group 2.—Maize, 17 oz.; straw, 5 oz.
Group 3.—Barley, 17 oz.; straw, 5 oz.
Group 4.—Lucerne hay, 20 oz.; straw, 4 oz.

In addition, approximately 1 oz. of cod liver oil per week was fed to each sheep.

All rations provided considerably more nutrients than were required for the maintenance of the sheep. Although there was very little difference between those fed grain, the results indicated that wheat was a little better than barley, but not quite so good as maize, and that 2 lb. grain had approximately the same food value as 3 lb. lucerne hay. On each ration the growth of wool was calculated at 21 to 32 bales for 1,000 sheep, and it was found that it took about 6 tons of grain to produce one bale of wool.

It was further calculated that to fully maintain a flock of 1,000 sheep with an average live weight of 90 lb. in reasonable store condition for one month on hand feeding alone, it takes one or other of the following quantities of fodder:—

Wheat, 12½ tons or 466 bushels of 60 lb.
Maize, 12 tons or 480 bushels of 56 lb.
Barley, 13 tons or 584 bushels of 50 lb.
Lucerne hay, 18 tons.

This calculation allows each sheep approximately 1 lb. of grain or 1½ lb. lucerne hay per day.

Since grains are very low in basic elements such as lime and soda, the Council for Scientific

A satisfactory self-feeder made from galvanized iron.

and Industrial Research investigators advised that sheep subsisting on grain alone should be allowed access to a lick of salt and powdered limestone, unless the drinking water supplied enough of these elements.

Feeding Trials in New South Wales.—In a series of articles published in *The Agricultural Gazette of New South Wales,* Mr. W. L. Hindmarsh, B.V.Sc., M.R.C.V.S., Director of Veterinary Research, has given the results of several feeding trials conducted by the New South Wales Department of Agriculture at the Nyngan Experiment Farm. From these trials it was ascertained that:—

Cereal hay is a valuable fodder for maintaining sheep in good condition for long periods and sheep require up to 2 lb. per day.

Silage alone cannot be depended upon to maintain sheep in reasonable store condition for long periods. Sheep receiving 3 lb. of silage daily lost considerably in condition during the trials.

Silage is useful when fed in conjunction with other foods such as hay or maize. Sheep maintained their condition on rations of 1½ lb. of silage and 1½ lb. of hay, and only lost a little condition on rations of 1½ lb. of silage and 4 oz. of maize.

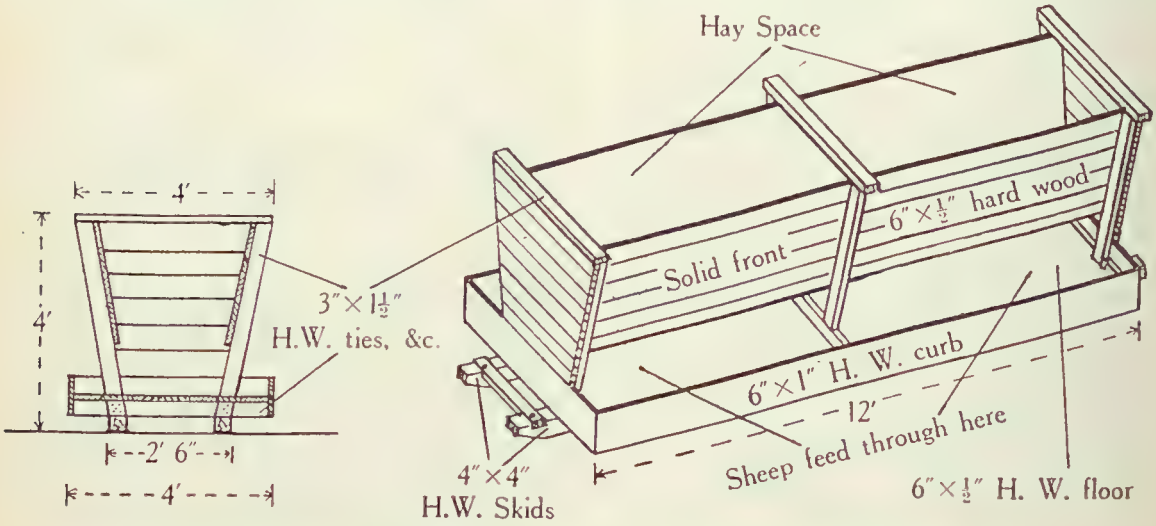
Under ordinary conditions, the expense and labour involved in feeding concentrates is not warranted.

The proprietary concentrates tested gave no better results than maize or rice and were more costly.

It is possible for ewes to bear and rear lambs under conditions of hand feeding.

Practical Supplementary Feeding.

Hand feeding is of importance on all farms during the lean seasons or periods of drought. Where sheep have access to dry pickings, stubbles, or straw stacks, a considerable amount of roughage is foraged and the sheep can be given supplements of grain or good meadow hay. The amount to feed will depend upon the roughage grazed. On farms where only scant green pickings are available, as frequently occurs during winters following very bad summers and autumns or grass fires, a roughage such as meadow hay provides the best supplement. Ordinary hay and chaff can also be fed



A useful type of hay-rack for sheep. (End elevation—left; Side view—right.)

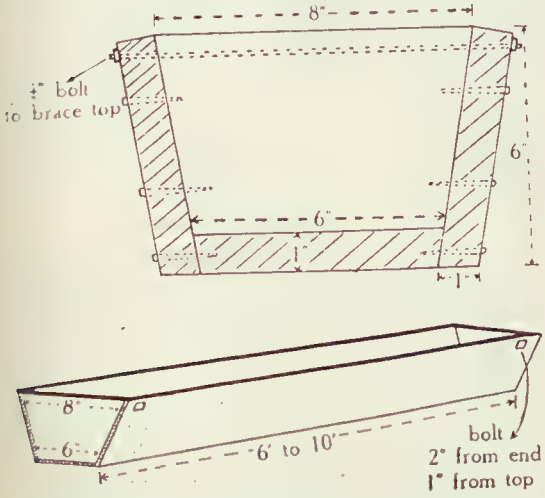
satisfactorily, while straw may give fair results, but the best oaten straw is not worth half as much per ton as hay or chaff.

The wrong time to buy feed is at feeding time. Everybody else is then buying feed, which is usually in merchants' hands and offered at high prices. Some farmers do not wish to conserve hay or silage or grow grain on their own properties, but buy feed from their neighbours at harvest time and hold it until required. Oats and baled hay are very convenient feeds to buy, store, and feed out to sheep.

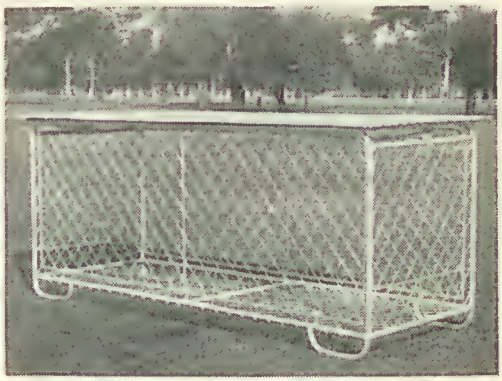
Old galvanized iron tanks are commonly used satisfactorily for the storage of oats, while small concrete silos make a more lasting storage bin. A 1,000-gallon tank will hold 125 bushels of oats, which will supply a half ration (8 oz.) to a flock of 100 sheep for three months. Normally, it is not necessary to feed more than 4 oz. of oats per sheep daily and, at this rate of feeding, a 3,000-gallon tank will hold sufficient oats for 1,000 sheep for two months.

Baled grass hay is very convenient to handle and takes much less room in the shed than loose hay. To house 10 tons of baled grass hay (250 cubic feet to the ton) a shed 10 feet wide, 20 feet long, and 12½ feet high is required. Ten tons of grass hay will supply a half ration (12 oz.) to a flock of 300 sheep for 100 days, although, normally, 6 oz. of hay will be sufficient, when 10 tons of grass hay will feed 1,000 sheep for two months.

The method of feeding oats is similar to that of feeding wheat, which has already been explained. The oats should be fed on clean, hard ground. Small feed troughs can be used and are easily made from 6-in. x 1-in. hardwood timber as shown in the accompanying diagrams. While meals, chaff, and a variety of foodstuffs can be fed in such troughs, the disadvantage is that a long length of troughing is required, otherwise the greedy, strong, bossy animals get all the feed. Sheep will feed from both sides of a trough, and between 100 and 125 feet of troughing is required for 200 sheep. The troughs should be moved regularly so that the ground around them will not be cut up. A bag of oats will be sufficient to supply 8 oz. each to a flock of 250 or 4 oz. to a flock of 500 sheep.

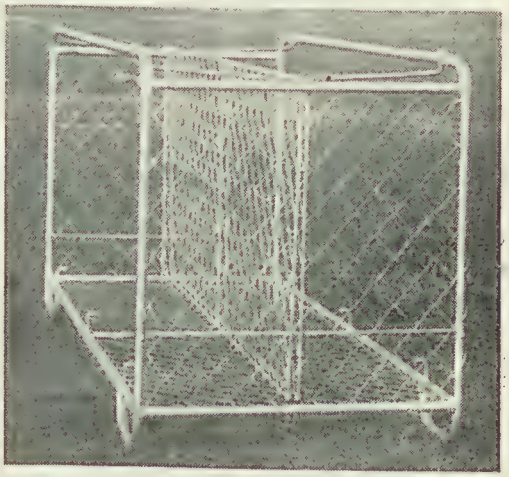


Trough for feeding grain or chaff, may be cheaply constructed of 6" x 1" h.w. (End elevation—top; Side view—lower.)



A portable all-metal hay-rack.

Baled meadow hay can be fed either by dropping bales here and there and allowing the sheep to nibble at the bale, by opening the bale and spreading the hay on hard, clean ground, or by feeding in racks. There is more waste



Portable all-metal hay-rack as emptied by the sheep.

with the first two methods. Feeding in racks is recommended and explained later. A bale of meadow hay will supply 6 oz. of feed to 125 sheep.

Methods of Hand-feeding.

Many expedients have been adopted in times of stress. In timbered country, logs may be placed about 15 or 16 inches apart, and bags tacked between. A space of from 12 to 15 inches per sheep should be allowed. Satisfactory bag troughs can be made by threading wire through bags placed end to end. The wires should be strained about 15 inches apart; a 6-inch sag at the bottom should be allowed. Supports about 1 foot high should be driven in every 9 feet to hold up the edges of the troughs. These troughs should be placed in a sheltered position so that they will not be blown about by the wind. A wire passed along the bottom of the trough will help to prevent this. Another wire should be strained above the middle of the trough to prevent the sheep from jumping into or across the trough. Wooden troughs should be made about 9 in. wide at the bottom. Galvanized iron may be bent up to make satisfactory troughs. On bare ground, linseed and grain may be broadcast with little waste, though trough feeding is desirable. In feeding hay or straw, racks are necessary to reduce waste. Wire netting (2½-inch mesh) is useful for making racks. In constructing wooden racks, there are two principles to be considered—firstly, they should be fairly straight-sided, so that straw, &c., will not fall down into the wool; secondly, they should have a fair capacity so as to cut down the labour involved. A suitable size is one 6 feet high, 2 feet 6 inches wide at the bottom on the ground, and 7 feet wide over all at the top. The rack slats 3 inches by 1 inch can be spaced from 5 to 6 inches apart.

Unquestionably the ideal method of feeding chaff to sheep is by means of the self-feeder. With it there is practically no waste; the weaker sheep fare better, and the labour is reduced to a minimum.

In constructing self-feeders, there are several principles to be observed:—(1) A self-feeder should be of ample capacity to ensure that the labour of filling is reduced to a minimum; (2) the roof should project over the trough to keep off the rain, and so ensure that the chaff will not be blocked by being wet; (3) the feeder must be placed in a sheltered position so that the wind will not whirl out the chaff. To avoid this latter loss, which may be very serious one, it is advisable to extend the ends of the feeder past the troughs, and so keep the wind out. Self-feeders are not fool-proof, and it is always advisable to make daily inspections to see that the feed is running freely. The diagram on page 591 shows an outline of a type of self-feeder in common use.

Duration of Hand Feeding.

It is essential to commence hand-feeding early, to carry it out thoroughly, and not to terminate it for some time after the grass has had a good start. Hand-feeding should never be delayed until the sheep begin to lose condition. If condition be lost, and the sheep be put on unusual foods, there may be serious losses owing to the weakening of the constitution, and the consequent inability of the digestive organs to assimilate the unaccustomed foods.

Ample Water Necessary.

It is always necessary to have ample water close at hand when feeding on dry foods, for long trips for water are very weakening. At times in parts of Victoria where the water obtained from bores is highly mineralized, the amount of salt in it may be excessive, and lead to kidney troubles due to the formation of calculi. Though the exact tolerance of sheep for the different salts in the water supply is not definitely known, observations made by the chemist's branch of the Department of Agriculture would indicate that water containing up to 300 to 400 parts salt per 100,000 is quite suitable; water containing from 400 to 1,000 parts should be used for short periods only, and water with more than 1,000 parts per 100,000 should not be used at all, except perhaps only for very short periods in cases of dire necessity. The latter strength corresponds to about 1½ oz. of salt per gallon of water.

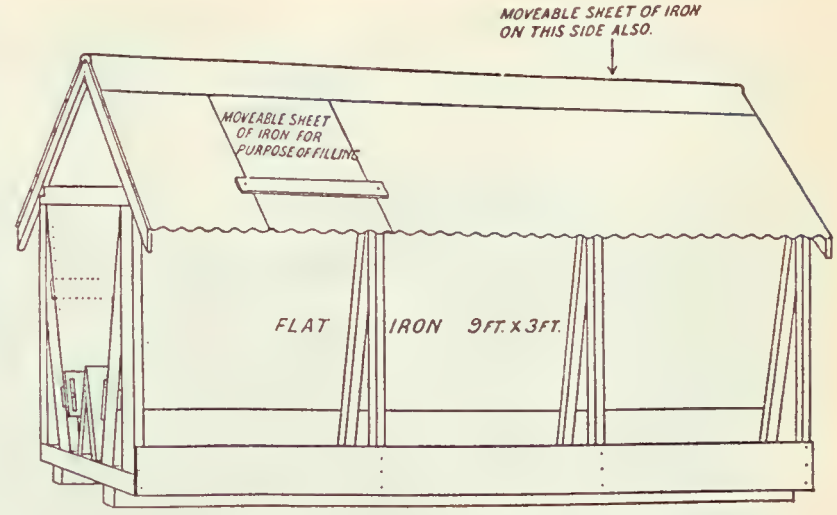
Supply of Salt Necessary.

The supply of plenty of salt is also necessary. In the experiments conducted at the State Research Farm, the average amount consumed per day per sheep was 0.19 oz., or approximately 1.33 oz. per head per week, or, roughly, 4½ lb. of salt per year. Of course, these figures might not hold in the case of sheep on natural pastures. For wet sheep, it has been found that the salt requirements are considerably greater. On farms where salt is present in the water supply in excess of 100 parts per 100,000, salt licks are unnecessary.

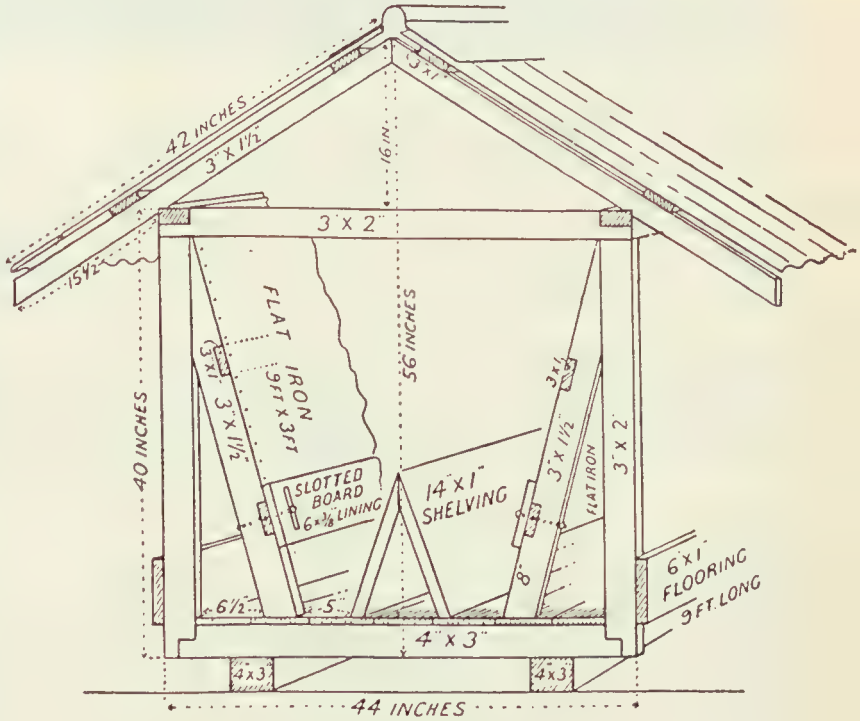
Some Varieties of Foods Necessary.

When feeding for lengthy periods, it is found that mixed foods give better results than obtained from the prolonged use of single foods. With mixed foods the ration is better balanced, and they have a greater palatability. With a variety of fodders, there is always less danger of the sheep "going off" their food. In New South Wales, however, when lucerne hay was fed at the rate of 3 lb. per day to 85-lb. merino wethers, it was found that, on this ration, they could be maintained for a year without any ill effects, though much better results were obtained with a ration of lucerne and maize. Owing in part to its greenness, lucerne hay is very palatable, and this, coupled with the fact that it was fed liberally, gives the probable explanation.

Mixing foods also supplies some balance between the bulkier and the more concentrated foods. The roughages are necessary to give enough ballast for the digestive organs to function properly, whereas the grains and other concentrated foods supply the greater bulk of the nutriment. Foods which are unpalatable, such as straws, hay, &c., may often be fed when mixed with a little molasses. Bales of straw have been soaked in a tank containing a solution of molasses and water, and fed with good results. Chaff, &c., can be damped in a solution of molasses broken down with from 5 to 6 parts of hot water.



Side View.



End Section.

A satisfactory type of self-feeder.

Feed in Small Flocks.

It is always found, when feeding, that the strong sheep get in first, and the weaker are pushed to the rear. It is, therefore, advisable to have plenty of troughing accommodation. If the fodders are broadcast, it is essential to feed in small mobs; then the weaker sheep can be separated and fed together.

The 4-4-2 Mixture.

In a recent series of drought feeding tests conducted by the Council for Scientific and Industrial Research with twenty food mixtures containing wheat, maize, barley, lucerne, linseed, dried blood, casein, yeast, wheat straw, and paper pulp, it was found that the feeding of lucerne to sheep improves their digestion of straw or dry paddock feed, and that a mixture of lucerne hay and grain promotes most satisfactory wool growth and maintains the sheep in good condition.

From these tests, the 4–4–2 mixture has been developed. This mixture contains four parts of grain, four parts of lucerne hay, and two parts of molasses compounded into nuts. It represents as near an ideal balance of the various classes of foodstuffs necessary to support a sheep as is likely to be achieved in feasible concentrated form.

The molasses is added both as a foodstuff and a gum to stick the other materials together as a nut. It is not necessary where the owner has the facilities to grow and feed out the lucerne hay and grain.

COMPARATIVE FOOD AND MONETARY VALUES OF FODDERS COMMONLY FED TO SHEEP.
(Oats, 2/- a bushel.)

Fodder.	Food Values.			Monetary Value based on the Price of Oats at 2s. per Bushel.
	Dry Matter.	Starch Equivalent.	Protein Equivalent.	
Green Fodders—	%	%	%	
Pasture, succulent	20	14	4·5	Not marketable. Grazed where grown
Pasture, flowering	25	14	2·2	
Lucerne, flowering	24	9	2·5	
Oats, feeding off stage	18	9	2·0	
Barley, feeding off stage	19	9	1·8	
Sorghum	20	8	1·0	
Hays—				
Mixed Grass and Clover	85·5	36	2·9	£3 5s. per ton
Lucerne	90·0	35	8·3	£3 3s. 2d. per ton*
Oaten	87·4	42	3·5	£3 15s. 10d. per ton
Wheaten	86·7	31	3·0	£2 16s. per ton
Silages—				
Mixed Grass and Clover	20·0	8	1·2	14s. 5d. per ton
Lucerne	25·0	11	2·0	19s. 10d. per ton
Oaten	29·0	12	0·9	£1 1s. 8d. per ton
Wheaten	30·0	12	1·0	£1 1s. 8d. per ton
Maize	25·0	9	0·7	16s. 3d. per ton
Straw—				
Oaten	89	21	0·6	£1 17 11d. per ton
Wheaten	89	13	0·1	£1 3s. 6d. per ton
Barley	90	23	0·7	£2 1s. 6d. per ton
Grains—				
Barley	87·0	71	6·8	2s. 10½d. per bushel
Maize	87·5	77	7·4	3s. 5½d. per bushel
Oats	89·0	62	7·6	2s. per bushel
Rice, polished	87·9	82	5·7	£7 8s. 1d. per ton (2,240 lb.)
Sorghum	87·2	68	6·4	2s. 2½d. per bushel
Wheat	88·5	72	8·3	3s. 5½d. per bushel
By-Products—				
Blood Meal	90·5	66	65·0	(£5 6s. 8d. per 2,000 lb.)*
Bran	89·4	44	9·9	£3 11s. per 2,000 lb.
Linseed Meal	89·0	72	23·7	(£5 16s. 1d. per 2,000 lb.)*
Meat Meal	99·5	84	54·5	(£7 12s. per 2,000 lb.)*
Pollard	89·5	69	10·6	£5 11s. 3d. per 2,000 lb.
Molasses (sugar cane)	76·0	49	1·2	£4 8s. 6d. per ton (2240 lb.)

* To these prices must be added the value of the extra protein.

Live Stock Notes

Animal Industries' Contribution to National Effort

Compiled by A. C. T. Hewitt, M.Agr.Sc., Livestock Science Officer

A good reliable food supply is one of the strongest weapons of war. Great Britain has placed substantial contracts for eggs, butter, cheese, bacon carcasses, and meat with Australia at satisfactory prices to producers. The importance and means of fulfilling these contracts are featured in these notes.

SINCE the outbreak of war, the United Kingdom Government has contracted to buy most of Australia's surplus primary products at prices that, in the circumstances, must be regarded as reasonable. Butter and cheese prices, for instance, are such that, after equalization, the farmer will receive an average return of at least 1s. 4d. per pound for butter-fat. The price received for exported bacon carcasses enables buyers to pay 6½d. per pound dressed carcass weight for first grade bacon pigs on the hoof. Apparently butter, cheese, and bacon pig carcasses will receive priority over all other cargo in the rationing of refrigerated cargo space.

To help fill the general meat contract, Victorian farmers will supply a very large quantity of lamb and mutton. The price being paid for first quality light-weight lambs is 6½d. per pound of frozen dressed weight, plus skin values on the hoof.

Since boneless beef and veal have been re-included in the shipping list for meat, dairy farmers should again receive good prices for bobby bull calves and cull dairy stock.

Eggs, too, are included in the purchases by the British Government, the contract price for 2-oz. eggs being 117.5d. sterling per long 100, which is equivalent to 1s. 2¾d. per dozen f.o.b., Australia.

Although not covered by contracts, England has agreed to take all the dried and condensed milk that can be produced. Markets for these commodities are also to be found in the East.

The United Kingdom Government does not require from Australia a number of commodities such as wheat, fresh fruit, and wine. It is suggested, therefore, that where possible those engaged in these industries, should undertake as a side line the production of commodities for which there is either an export or local market, such as pig raising, poultry keeping, or dairying.

Specialist officers, veterinary officers, stock inspectors, and dairy and orchard supervisors of the Department of Agriculture will advise and co-operate with farmers in the economic production of eggs, butter, cheese, pigs, &c. Wherever required the services of these men should be solicited either by direct contact or by application to the Director of Agriculture, Treasury Gardens, Melbourne, C.2.

Dairy Cattle.

The three most important requirements for successful dairying are—(1) a market for dairy produce, (2) cows to produce it, and (3) feed for the cows.

Seldom have these three conditions been favorable at the one time, and frequently both the seasons and markets are poor. This year, due to the seasonal conditions, the feed position is bad. The market for dairy produce has seldom been better and farmers are assured of an average return of 1s. 4d. per pound for their butter-fat. Farmers also have the cows which, although capable of being greatly improved, are generally good cows. The feed supply will be the limiting factor to this years' production.

The trend in dairy farming has been towards maintaining the herds solely on pastures and pasture products such as grass hay and silage. This system of dairy farming has its limitations in adverse seasons when, through the failure of the pasture crop, a shortage of both grazing and conserved fodder is created. This stresses the need for a lucerne paddock and some crop paddocks where oats, maize, millett, sorghums, or other crops can be grown for supplementary green feed, hay or silage. The practice of buying supplementary feed to tide over adverse seasons is always a costly procedure, and absorbs most of the profits obtained in good seasons. However, it is usually more profitable to feed the cows well because production, which more than pays for the feed, is maintained and the cows, being kept in good condition, are able to produce maximum yields when the season breaks and natural feed comes again.

In well-fed herds, there will be no abnormal losses of cows. Dairy cows are worth over £10 each. Ten pounds will buy about 2 tons of oaten chaff, or 1½ tons of bran or pollard. Where there is a danger of dairy stock dying, the losses may be very much greater than the cost of fodder, which would not only keep the cows in good condition, but also keep them in production. To reduce the cost of supplementary feeding, every farmer should aim at conserving 2 tons of hay or 5 tons of silage per cow each year.

With seasonal conditions as they are, it will be difficult to produce sufficient butter and cheese to supply Great Britain with the desired 100,000 tons of butter and 20,000 tons of cheese by the end of June, 1941. However, there are few reasons why exports should be down very much below these figures. It is in the individual as well as in the national interest that high production should be maintained. Next year's contracts probably will be based on the efforts made to complete the present contracts. Further, if cows are allowed to drop in yield and condition, their production next year will be seriously reduced. The dairying industry is facing severe competition and cannot afford to lose its market which will be quickly, and probably permanently, filled by margarine.

Efficiency is more important than ever before, particularly the efficiency of the dairy cows themselves. Those which are inefficient should be disposed of to reduce the cost and labour of hand feeding.

Pig Raising.

In addition to looking for new avenues of pig production to help the national effort, increased efficiency should be aimed at and wastage should be reduced in existing piggeries.

Efficiency in pig production means producing the greatest possible quantity of pig meat from the available food supplies. Producers generally have such an objective in view, but present circumstances require special effort in this direction.

Costs of production are increasing, the export price of pig meat is fixed, and it might be expected that local prices will keep close to

export parity. An endeavour should be made to produce at a cost which will allow the Australian commodity to be sold overseas at prices in line with products of other countries, and it is reasonable to expect that post-war economy will necessitate efficient production.

There are many ways in which waste is occurring in the pig industry of which the following are examples.

Brood sows sometimes fail to breed regularly, frequently producing only three litters or less in two years, where they should be producing four litters. This often happens where records are not kept of service dates and farrowing dates, and sows failing to hold to the first service are overlooked for months and thus allowed to waste time and food. Service records give a check on the fertility of the boar and sow, and may even indicate cases of abortion.

The litter production of sows should be recorded by weighing litters when eight weeks old, when it will be found that there is a wide variation in the total weights of the litter of different sows. This is due to the variation in producing capacity of sows, and to the efficiency of feeding and management. It is only by weighing litters that errors in feeding and management can be found and corrected.

Keeping records of the age and weight of pigs when marketed will show further differences in production efficiency. Good pigs should reach 200 lb. live weight when 200 days old. When they are much slower in growth, the reason should be sought.

Food costs are the biggest item in pig production, and the quantity of food required to make a pound of pork may vary from 5 to 7 lb. or more; high food consumption may be due to worm infestation, faulty feeding or faulty housing.

Record keeping with pigs is not a very big job, and it will pay handsome returns; waste of food and time is rarely recognized by the pig breeder who does not keep records of services, farrowings, weanings and marketings.

(L. A. Downey, H.D.A., Pig Expert.)

Poultry.

In Victoria, eggs have never been produced solely for export. Hens lay large numbers of eggs in the spring and very few in the late autumn and early winter, and poultry farmers in trying to produce sufficient eggs for local requirements, at relatively high prices, produce in the spring a surplus which is exported. The prices received for export eggs have always been surplus production prices, and too low for poultrymen to produce eggs solely for export. Export eggs are chilled and cannot compete with fresh eggs, therefore they are in demand in England only during the late autumn and early winter months, when fresh eggs are not available.

Following the action taken by the British authorities to reduce poultry farming and the loss of eggs normally imported from nearby European countries, the British Ministry of Food has consented to take all eggs of export quality from Australia until the end of February.

Poultry keeping offers opportunities as a sideline to all types of farming and business occupations. It has advantages over many other sidelines in that practically all the work can be performed by female labour, while, on farms, part or all of the poultry food, including grain, skim milk, and greenstuff, may be home-grown.

Successful poultry farming is dependent upon the efficiency of the operator. Good fowls are required; they must be properly housed, adequately and regularly fed, and the eggs must be regularly collected, cleaned, kept cool, and marketed at least twice a week.

On an efficiently conducted farm, the principal factors governing financial success are the number of eggs produced per bird, the prices obtained for the eggs and the cost of the food. Most successful poultry men aim at producing up to 15 dozen eggs per bird per year, instead of the usual 10 or 12 dozen average; marketing the eggs in the best possible condition, so as to obtain the top market prices; and producing part or all of the food.

Sheep.

If it were not for the seasonal conditions, the sheep industry would be in an extremely favorable position. Britain has contracted to buy all the wool, mutton and lamb at highly satisfactory prices.

The British contract for the purchase of meat is for 249,000 tons of beef, mutton, lamb and various pig meats. No particular quota of mutton and lamb is specified, and the conditions of the contract are such that there is not likely to be a surplus of exportable meats this year. Last year, a surplus led to stopping the export of certain classes of meat, such as all ewe mutton, except two-tooth ewe mutton and low-quality carcasses.

It is not expected that Great Britain will require increased quantities of lamb and mutton, and it would be unwise to increase production, although improvement in quality must be effected.

Before the war, breeders were led to regard quality more as a matter of carcass weight than of the relative development of muscle, fat and bone within the carcass. The prices paid by Britain for lamb give emphasis to the value of quality within the carcass. Prices being paid for first quality spring lambs vary from 6½d. per pound frozen weight for light-weight lambs (20–28 lb.) to 5 9/16d. for heavy-weight lambs (43–50 lb.). For second quality the prices vary from 6⅜d. to 4⅝d., and for third quality light-weight lambs the price is 5¾d. and 5 5/16d. for lambs over 29 lb.

Little improvement in the quality of lambs can be expected until breeders adopt a system of carcass appraisal on similar lines to that being adopted by pig breeders. When this is done, sires and strains producing a high percentage of the right class of lambs can be segregated and developed for breeding purposes.

Horses.

In the national effort to assist the Empire, the horse is taking a very important indirect part. By efficiently using all available working horses for transport and farm power purposes, great savings in the quantities of imported fuel, oil, spare parts and machines can be made.

There have been many arguments and debates on the subject "Horses versus Tractors," and admittedly there is much to be said for both sides, but the efficiency of the tractor depends largely on the cost of fuel, and it stops when the fuel supply is cut off. The use of tractors also has tended to increase the acreage sown to such crops as wheat.

Where horses are worked, a considerable portion of the cropping area is sown with oats for horse feed. This encourages crop rotation, reduces the area of the principal crop sown, makes the farm more self-supporting, as there is no outward expenditure for fuel, oil, spare parts or new machines, and spreads the labour more evenly throughout the year.

The extent to which horses can be used is limited by the number of horses available since immediate attempts to increase the horse population by breeding would not show results for five years. Unfortunately the horse population has been allowed to dwindle considerably in recent years, and there is a likelihood of a scarcity of animals in the near future unless more horses are bred, and those on hand are efficiently and effectively cared for.

Bees.

This month the work in the apiary will vary with the conditions in the particular locality. In districts where there is plenty of clover and red gum blossom, the bees should have settled down to honey gathering. Where no extracting has been done the plant should be thoroughly overhauled. The comb should be removed from the hives for extraction as soon as it is sufficiently well sealed, otherwise the hives may become so full that work will stop and the bees swarm again to relieve congestion.

Except for the desert country near the South Australian border, the prospects of receiving honey in the western part of Victoria from the red gum blossom are very poor, but, although it is early to forecast the extent of the blossoming of grey box and ironbark, the prospects of a good late summer and autumn flow of honey should not be overlooked. Where pollen is available, the colonies should be built up to full strength in anticipation of a heavy flow of nectar.

[J. S. Eagland and J. W. Thomlinson, Apiary Inspectors.]

Arsenical Poisoning of Stock

By W. M. Lerew, G.M.V.C., Veterinary Officer

OWING to the very wide use of arsenic in various preparations in every-day use, this mineral is probably responsible for more cases of poisoning of stock than all the other poisons combined. It is found in most sheep-dipping preparations, weed destroyers, vermin killers, paints, &c., while the pastures in the vicinity of smelting works may be contaminated by the fumes which are given off from the works. The different compounds of arsenic vary greatly in their toxic properties, metallic arsenic, if pure, being almost inert, while the alkaline compounds (those combined with sodium or potassium) are the most poisonous of the ordinary arsenical preparations.

It is the solubility of these alkaline compounds that makes them so dangerous to stock, as they are readily absorbed, and quickly give rise to the symptoms of poisoning. The great majority of cases of arsenical poisoning are accidental, but a certain number result from deliberate administration of the poison, especially in the case of horses and cattle.

Among the many ways in which stock may be accidentally poisoned the following are the commonest. Cattle with depraved appetites, due to mineral deficiency in the diet, may lick fresh paint or old tins of paint in rubbish tips, &c. Sometimes they eat herbage that has been sprayed with weed killer; or they may be fed from feeders, the boards of which have been treated with arsenic as a protection against white ants.

During sheep-dipping operations losses may be incurred by holding an animal too long under the surface of the dip, or from thirsty sheep drinking the dipping fluid. Also sheep that have been cut about during shearing may be poisoned by absorption of the poison through the skin wounds.

As arsenic is very much more toxic when absorbed through skin wounds, any injuries caused through shearing should be allowed to heal before the animals are dipped in an arsenical dip. After dipping, sheep should be allowed to stand in bare draining pens till all surplus fluid has drained off the wool. When cleaning out the dip after use care should be exercised in seeing that the dipping solution does not contaminate drinking pools or streams.

Symptoms.

In acute cases the symptoms of arsenical poisoning appear rather suddenly about an hour after the poison has been taken. There is profuse salivation or slobbering with the movements of swallowing, and also intense thirst. The animal is very restless and may show acute colicky pain. The abdomen is tender on pressure, and at first there may be constipation, which is followed by a foul smelling blood-stained diarrhoea with a garlic-like odour. The breathing is difficult, urine is scanty, thick, and often blood stained. The temperature is low, and the extremities become cold, and after a time rigors or attacks of shivering set in, the gait is staggering, and the animal collapses in intense pain and dies in from four to five hours.

In sub-acute cases the symptoms are much the same as those previously described, but not so violent. The animal becomes very weak; paralysis of the hind quarters sets in, and death follows in two or three days.

When dogs are the victims, vomiting is one of the symptoms shown, the material vomited being large in quantity and of a white colour.

Post-mortem Appearance.

The most noticeable sign of arsenical poisoning is the intense rose-red inflammation of the mucous membrane of the stomach and intestines, with small blood spots scattered through this area. In cattle the lining of the abomasum (fourth stomach) may be dark violet or black, and can be easily detached from the underlying muscular coat. In pigs the inflammation may be noticed in the mouth and throat also.

[*Continued on page* 599.

Acquisition of Apples and Pears for 1940-41 Season

IN consequence of there being no shipping space available for export of fruit owing to the war, several conferences between Commonwealth and State Governments and fruit-growers representing all the States were held, and the Commonwealth Government has now decided to acquire the apples and pears for the 1940-41 season. Apples and pears harvested during December, 1940, will also be acquired.

Williams Bon Chretien pears, with the exception of those to be canned, are to be included in the scheme, whereas last season this variety was excluded.

The fruit is to be classed into three groups, and the prices to be paid are shown in the following lists:—

APPLES.

Varieties, Qualifying Sizes and Rates of Advances.

VICTORIA.

The varieties referred to hereunder will be paid for at the rates shown in each instance.

Group 1—Varieties.

(*a*) Delicious, Democrat, Granny Smith, Jonathan, Gravenstein, Legana, Beauty of Bath, Williams Favourite, Willie Sharp, Carrington, Kirk's Seedling, Cowell's Red, Cleopatra, Statesman, Rome Beauty.

X.F. and Fancy, 2½-inch or better, 3s. 6d.
X.F. and Fancy, 2¼-inch minimum, 3s.
Good, 2½-inch or better, 2s. 6d.
Good, 2¼-inch minimum, 2s.

(*b*) Peasgood, Twenty Ounce, Mobb's Royal, Lady Daly, Trivett, Lord Nelson, Warner's King.

X.F. and Fancy, 2¾-inch or better, 3s. 6d.
X.F. and Fancy, 2¼-inch minimum, 3s.
Good, 2¾-inch or better, 2s. 6d.
Good, 2¼-inch minimum, 2s.

(*c*) Cox's Orange Pippin, Crofton, Dougherty, Yates.

X.F. and Fancy, 2⅜-inch or better, 3s. 6d.
X.F. and Fancy, 2¼-inch minimum, 3s.
Good, 2⅜-inch or better, 2s. 6d.
Good, 2¼-inch minimum, 2s.
X.F. and Fancy, 2⅛-inch minimum, 2s.

Group 2—Varieties.

(*a*) Australian Beauty, Scarlet, Tasman's Pride, Geeveston Fanny, Golden Delicious, King Cole, Duke of Clarence, Nickajack, Rokewood, Stone Pippin, Sturmer, Dunns, McIntosh Red, Stayman.

X.F. and Fancy, 2½-inch or better, 2s. 6d.
X.F. and Fancy, 2¼-inch minimum, 2s.
Good, 2¼-inch minimum, 1s.

(*b*) Worcester.

X.F. and Fancy, 2⅜-inch or better, 2s. 6d.
X.F. and Fancy, 2¼-inch minimum, 2s.
Good, 2¼-inch minimum, 1s.

(*c*) French Crab, Alfriston, Prince Alfred, Ballarat (Stewart's Seedling), London Pippin.

X.F. and Fancy, 2¾-inch or better, 2s. 6d.
X.F. and Fancy, 2½-inch minimum, 2s.
Good, 2½-inch minimum, 1s.

Group 3—Varieties.

Alexander, Ribston Pippin, King Pippin, Coleman, Ranelagh, Ben Davis, Strawberry Pippin, Spitzenberg, Wellington Pippin, Pioneer, Pomme de Neige, Newtown Pippin, Auradell, Yapeen, Schroeder, Buncombe, King David, Crow Egg.

X.F. and Fancy, 2¼-inch minimum, 1s.
Good—not qualifying.

PEARS.

For Sale as Fresh Fruit.

VICTORIA.

Group A—Varieties

Williams Bon Chretien.

X.F. and Fancy, 2½-inch or better, 4s.
X.F. and Fancy, 2¼-inch minimum, 3s. 6d.
Good, 2½-inch or better, 3s.
Good, 2¼-inch minimum, 2s. 6d.

Group 1—Varieties.

(*a*) Packham's Triumph, Doyenne du Comice.

X.F. and Fancy, 2½-inch or better, 5s.
X.F. and Fancy, 2¼-inch minimum, 4s.
Good, 2½-inch or better, 3s. 6d.
Good, 2¼-inch minimum, 3s.

(*b*) Josephine, Beurre D'Anjou, Winter Nelis.

X.F. and Fancy, 2⅜-inch or better, 5s.
X.F. and Fancy, 2¼-inch minimum, 4s.
Good, 2⅜-inch or better, 3s. 6d.
Good, 2¼-inch minimum, 3s.

(*c*) Winter Cole.

X.F. and Fancy, 2¼-inch or better, 5s.
X.F. and Fancy, 2⅛-inch minimum, 4s.
Good, 2¼-inch or better, 3s. 6d.
Good, 2⅛-inch minimum, 3s.

Group 2—Varieties.

(*a*) Beurre Bosc, Beurre Hardy.

X.F. and Fancy, 2½-inch or better, 3s. 6d.
X.F. and Fancy, 2¼-inch minimum, 3s.
Good, 2½-inch or better, 2s. 6d.
Good, 2¼-inch minimum, 2s.

(*b*) Lemon Bergamot, Glou Morceau, Madame Cole.

X.F. and Fancy, 2⅜-inch or better, 3s. 6d.
X.F. and Fancy, 2¼-inch minimum, 3s.
Good, 2⅜-inch or better, 2s. 6d.
Good, 2¼-inch minimum, 2s.

Group 3—Varieties.

(*a*) Keiffer.

X.F. and Fancy, 2⅝-inch or better, 2s. 6d.
X.F. and Fancy, 2⅜-inch minimum, 2s.
Good—not qualifying.

(*b*) Clapp's Favourite, Giblin's Seedling, Beurre Easter.

X.F. and Fancy, 2½-inch or better, 2s. 6d.
X.F. and Fancy, 2¼-inch minimum, 2s.
Good—not qualifying.

(*c*) Black Achan.

X.F. and Fancy, 2¾-inch or better, 2s. 6d.
X.F. and Fancy, 2½-inch minimum, 2s.
Good—not qualifying.

(*d*) Any other varieties required for marketing will be compensated on a basis of quality and size to be determined.

Arsenical Poisoning of Stock

(*Continued from page* 597)

Treatment.

The most important line of treatment in animals that are capable of vomiting, namely, dogs, cats, and pigs, is the administration of an emetic such as ipecacuanha wine, mustard and water, or salt and water. This should be followed by purgatives, raw linseed oil being the most suitable, and this should be given whether the animals are purging or not, the dose being ¼ to 2 pints for horses and cattle, and 1 to 8 oz. for sheep, according to size and age.

Soothing substances such as milk, white of egg, fatty substances, glycerine and lime water should be given in large quantities. When the diarrhoea is very severe, barley and linseed gruel should be given; up to 4 pints per day for horses and cattle and up to 1 pint for sheep or pigs being suitable doses. It is essential that the large quantity of fluid lost through purging, should, at least, be partially replaced.

In all animals it is essential to administer an antidote to the arsenic as soon as possible, and in the case of animals capable of vomiting, this should be given as soon as the emetic has done its work. The most effective antidote is sodium thiosulphate, commonly known as "hypo," which is in general use in photographic work, and obtainable practically everywhere. The dose for horses or cattle is 1 to 2 oz. (according to size) dissolved in half a pint of water, while ¼ to ½ oz. is a suitable dose for sheep or pigs. The dose may be repeated several times daily. Strong black coffee, heavily sweetened with sugar, at the rate of 1 to 4 pints for cattle or horses and 4 oz. to 1 pint per day for sheep should be given as a stimulant. These quantities may be divided into four doses, and one dose given every six hours.

Affected animals should be disturbed as little as possible, and every endeavour should be made to provide shade and shelter for them, as this is a very essential point in the treatment.

Lamb and Butter Prices

The following prices of lamb and butter on the overseas and local markets are published for the information of producers.

LAMB PRICES.

British Contract Prices.

F.O.B. AUSTRALIAN PORT.

	Sterling.	Australian Currency.
	Pence per lb.	Pence per lb.
1st quality 20/28 lb.	5–13/16th	7–17/64th
29/36 ,,	5–9/16th	6–61/64th
37/42 ,,	5–7/16th	6–51/64th
43/50 ,,	5–1/16th	6–21/64th
2nd quality 20/28 ,,	5–11/16th	7–7/64th
29/36 ,,	5–1/8th	6–13/32nd
37/42 ,,	4–3/4th	5–15/16th
43/50 ,,	4–5/16th	5–25/64th
3rd quality 20/28 ,,	5–3/16th	6–31/64th
29/50 ,,	4–7/8th	6–3/32nd

Local Prices.

PRICES PAID FOR LAMBS BY EXPORTERS—MELBOURNE.

Figures taken from *Stock and Land* reports of Newmarket Sales; prices exclusive of skin and offal.

	September.	October.	20th November.
	Pence per lb.	Pence per lb.	Pence per lb.
Prime light	6 to 6¾	5¾ to 6¼	5¾ to 6
,, medium to heavy	5¾ to 6¼	5¼ to 6¼	5¼ to 5¾
,, extra heavy	5¾	5 to 5¾	4¾ to 5
Useful to good	5¼ to 6¼	4¾ to 6¼	4¾ to 5¼
Plain	5 to 5¼	3¾ to 5¼	4¼ to 4¾

PRICES FOR LAMBS AS QUOTED IN "WEEKLY TIMES".

	September.	October.	20th November.
	Pence per lb.	Pence per lb.	Pence per lb.
Prime	5¾ to 7¼	5¼ to 7	5¾ to 6¼
Heavy	5 to 5¼	5 to 6	5¼ to 5¾
Plain	4½ to 5¼	4½ to 5¾	4½ to 5

BUTTER PRICES.

British Government Contract.

F.O.B. AUSTRALIAN PORT.

	Price in Sterling.		Price in Australian Currency.	
	Per cwt.	Per lb.	Per cwt.	Per lb.
	s. d.	s. d.	s. d.	s. d.
Choicest	109 9	0 11·76	137 2¼	1 2·7
First	108 6	0 11·62	135 7½	1 2·53
Second	104 11	0 11·24	131 1¾	1 2·05
Pastry	102 0	0 10·93	127 6	1 1·66

Wholesale Price in Australia.

	July.		November.	
	Cwt.	lb.	Cwt.	lb.
	s. d.	s. d.	s. d.	s. d.
Choicest	158 8	1 5	158 8	1 5
First	156 2	1 4·73	156 2	1 4·73
Second	153 8	1 4·46	153 8	1 4·46
Pastry	Very little pastry butter is sold in Australia, price varies from 112s. to 110s. per cwt.			

(First, Second and Pastry: No change from July)

Butter-fat Prices.

Butter-fat prices (for choicest quality) in July last, ranged from 15¾d. to 17½d. per lb. In October the range was from 14½d. to 16½d. per lb.

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley

Garden Notes.

ALTHOUGH most of the summer annuals should have been planted by now, it is not too late to make a late transplanting of any of the following: marigold, zinnia, celosia, portulaca, bonfire salvia, and phlox. The main planting of dahlias and gladiolus should be made during December to have them flowering from early March until the frosts. Dahlia tubers which are not planted until December will have shoots on them of various lengths. These growths should be cut off about a quarter of an inch above the tuber, and it will break again from the node just above the tuber. If the growth is not cut off, the roots are not advanced sufficiently to properly nourish the plant. If dahlias are planted in October, they will flower in January, but the flowers fade too quickly during the hottest part of the year.

Preparation of the seed bed should be carried out for sowing such winter-flowering annuals as the calendula, pansy, viola, ranunculus, anemone, cineraria, primula, winter-flowering sweet pea and Iceland poppy. The sowing of these seeds should be carried out not later than January, if they are to be planted out in March. This enables them to be well-established and ready to flower about the end of May. They should then flower throughout the winter and spring months. Too often sowing of the seed is put off until the autumn, and results in the plants not flowering until the winter is almost over.

The pansy is a very popular border subject, as it is not frost tender and will remain in flower from six to eight months. It is very hardy and most useful as a winter-flowering plant. Although it will survive for some years, it is better when treated as an annual. Cuttings which strike easily may be made from good varieties which are not setting seed freely. Cuttings taken in November should be ready for transplanting in the following March or April. It is essential to prepare the ground thoroughly, and a well-drained medium loam type of soil with farmyard manure and plenty of lime worked into it should give satisfactory results. If the soil is heavy and not well drained, the plants are prone to be attacked with stem rot. The seeds should be sown in January, and transplanted into their permanent position in March or early April.

When sowing any fine seeds, the soil should be well watered before sowing. After sowing just cover the seed with fine sand and well-decayed animal manure passed through a fine sieve. During the hotter part of the day, the seedlings should be protected by a hessian covering. Transplant in rows 15 inches apart with 12 inches between the rows. Pinch back the early flower buds to encourage the plants to thicken out. If growing for large flowers, allow only two or three on the same plant to open at the one time. Give an abundance of water during the dry period, and in the late autumn and early spring fork in lightly a dressing of blood and bone. Remove the blooms as they fade. There are many good varieties of pansy on the market, including the well-known Roggli's Giants. These may be obtained in separate or mixed colours. Yellow Queen, Coronation Gold, Amber Jewel, Night and Azure Blue are good standard types.

Vegetables.

The well-established summer vegetables require to be carefully watered and hoed. Water thoroughly, and do not merely wet the surface. As soon after watering as convenient, run the Dutch hoe through the vegetables to keep the top soil loose and prevent excessive evaporation. Watering without cultivating tends to make the soil run together and set very hard.

A dressing of farmyard manure, containing straw, may be used. It forms a mulch on the surface which assists in preventing excessive evaporation, keeps the soil at a more even temperature, and prevents puddling when watering.

Make further plantings of lettuce, French beans, cabbage, cauliflower, turnips, and culinary peas. If the early cucumbers, pumpkins, and melons are not setting well, pinch back the runners, as this tends to make them set better.

Cucumbers should be picked when about three parts grown and before they commence to show yellow. To encourage the plant to go on producing, do not allow any older ones to remain on the vine. For household purposes, the variety White Crystal Apple is very useful. It is about the shape and size of a medium-sized apple, matures quickly, and is a good cropper.

Orchard Notes

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DURING the month of December, soft-fruit growers will be anxiously watching for the development of brown rot. Warm, muggy weather is particularly favorable for the development of this fungous disease and later varieties of cherries and early varieties of peaches should be sprayed, if the incidence of this disease is to be reduced. Dessert peaches should be sprayed with a wettable sulphur spray—4 lb. in 100 gallons water—up to fourteen days before picking. If later treatment for peaches and cherries is required, an ammonium polysulphide spray —1 gallon in 80 gallons of water, plus 3 lb. of soft soap, may be applied. If a dry-mix lime sulphur spray was not applied to late canning peaches at the end of November, protection by spraying with a dry-mix lime sulphur, 25 lb. in 100 gallons, early this month is advised. The control of brown rot in apricots is a more difficult problem, because cover sprays containing copper and sulphur cannot be applied to this fruit at this time of the year. Where brown rot does occur in apricots, more attention to orchard hygiene, particularly in winter, must be given.

Recently, permission was given to pack lemons in the citrus export half-case, the dimensions of which are—24 inches long, 11¼ inches wide, 5¼ inches deep, inside measurements, clear of the division. Lemons intended for export should be wrapped in sulphite tissue paper, and the sizes should not be larger than 2⅝ inches or smaller than 2 inches. It is advisable to wire cases intended for export.

Breakwinds are an esential feature of successful fruit production in all localities where the local topography does not provide effective shelter. Very frequently, however, breakwinds do not receive the attention they deserve, and in these cases, they invariably compete with the nearby rows of trees both for moisture and food supply. Where water is available, irrigation by means of permanent ditches on either side of the breakwinds will prevent the breakwinds from competing with the fruit trees for

The effect of a sugar-gum windbreak (shown at right) on successive rows of pear trees.

moisture. In the accompanying illustration, the effect of a sugar-gum breakwind, which has recently been "lopped," can be seen on successive rows of pear trees in a Goulburn Valley orchard. These trees are all of the same age and are planted 22 feet apart.

Some growers adopt the practice of digging a trench on the orchard side of the windbreak to prevent root competition with the fruit trees. This is a very convenient practice, and in some cases, where the fall permits, an open trench can be used as a drain.

Strawing of Gravenstein apple trees and Williams' pear trees should be carried out during the month. Losses from windfalls, particularly of Williams' pears, are usually heavy, and the strawing of the trees reduces much of the damage caused to fallen fruit. There appears to be some beneficial effect from the pollination of Williams' pears, and growers find that when pollination has been provided, windfalls are less. Another recent and important development is the prevention of windfall fruit by applying a spray of the "Hortomone A" type which reduces the amount of fruit which falls. Experiments have already been made with this substance on Jonathan apples and Marsh Seedless grapefruit, with promising results.

A new bulletin on Tomato Culture in Victoria has been published recently by the Department of Agriculture. It comprises 73 pages of matter dealing with all phases of tomato culture, the treatment of diseases, and the control of insect pests. A comprehensive list of tomato varieties with recommendations for their handling is also included.

The bulletin may be obtained by remitting a sum of 5d., which includes postage, to the Director, Department of Agriculture, Melbourne, C.2.

PASTURE INVESTIGATIONS—*continued from page 570.*

TABLE I.—MANURIAL TRIALS, CALDERMEADE.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Aut'mn 1 cwt. Spring.
Yields in cwt. of Greenstuff per Acre.						
Total Annual Yields.						
1932 ..	196	297	293	287	290	310
1933 ..	124	238	233	256	249	261
1934 ..	194	360	321	341	345	395
1935 ..	285	503	494	477	526	502
1936 ..	238	465	433	445	472	475
1937 ..	203	301	304	310	326	318
1938 ..	41	118	126	141	140	125
1939 ..	298	384	369	378	383	369

Korumburra (F. E. Kurrle).

Mean Rainfall 46·1 *inches. Rainfall,* 1939, 52·9 *inches.*

This plot is situated on the fertile grey soil typical of the Gippsland grey hill country. Favoured by a liberal rainfall the soil supports a strong pasture of Yorkshire fog, cocksfoot, perennial rye, subterranean and white clovers.

The plot has sustained a good response to superphosphate, but though lime gave a fair response in the early years, the effect of the 1 ton dressing given in 1932 has since declined. The response to potash has only been small on this trial. The nitrogen treated plots have consistently shown a reduced yield as compared with those receiving super. only.

TABLE II.—MANURIAL TRIALS, KORUMBURRA.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Aut'mn 1 cwt. Spring.
Yields in cwt. of Greenstuff per Acre.						
Total Annual Yields.						
1932 ..	158	190	197	224	207	209
1933 ..	68	135	129	165	145	155
1934 ..	149	252	211	261	241	265
1935 ..	118	202	173	207	201	211
1936 ..	148	246	228	251	254	270
1937 ..	112	224	212	228	249	247
1938 ..	43	114	105	119	130	128
1939 ..	150	242	225	236	244	251

Warragul (C. Tyssen).

Mean Rainfall 40·5 *inches. Rainfall,* 1939, 54·2 *inches.*

Soil—a deep clay of brown to red colour, derived from older basalt, typical of much of the Gippsland red hill country.

When first established this plot had a pasture of cocksfoot and red clover, but the latter has now been largely replaced by subterranean clover. An attack by underground grass grubs thinned out the cocksfoot in 1937 and this coupled with the bad season of 1938 resulted in very poor yields being obtained during that year. The plot made a good recovery during the past year and the total yields were again normal.

In the first years, the response on this plot to super. was small, while the lime and sulphate of ammonia responses were marked. More recently the lime and sulphate of ammonia responses have declined, whilst the responses to super. and to super. and potash have tended to increase. On this plot, the response to potash has been inhibited by the action of the sulphate of ammonia which reduced the proportion of clover in the swards to which it was applied.

TABLE III.—MANURIAL TRIALS, WARRAGUL.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Aut'mn 1 cwt. Spring.
Yields in cwt. of Greenstuff per Acre.						
Total Annual Yields.						
1932 ..	81	89	97	126	102	96
1933 ..	49	55	71	89	77	58
1934 ..	87	111	105	126	113	125
1935 ..	59	108	76	115	90	113
1936 ..	87	151	116	134	160	159
1937 ..	40	51	47	60	67	68
1938 ..	10	18	25	39	36	25
1939 ..	61	131	96	126	141	148

NEW SERIES MOWING TRIALS.

In 1935 new mowing trials were established at Warragul and North Mirboo to ascertain to what extent the results obtained on the major plots would be applicable to the surrounding districts. At both these centres good results had been obtained with lime when used in conjunction with superphosphate, and these new trials were designed mainly with the object of ascertaining in the surrounding districts the response to lime when used alone, or with either phosphates or nitrogen. At the time that these plots were commenced no material responses to potash had been recorded in these districts, and no provision was made for including potash in these trials.

Three of these new trials were commenced at Warragul and three at North Mirboo. At North Mirboo lime responses similar to those recorded

on the original major plot have been obtained, but at Warragul the responses to lime have been small, and it now appears that better results are to be obtained from the use of super. and potash.

WARRAGUL DISTRICT TRIALS.

T. Boardman (Warragul).

This pasture consists mainly of cocksfoot with some red, white and subterranean clovers. It has usually shown good growth in the late spring, but has appeared lacking in vigour during the winter. Neither lime, super. nor sulphate of ammonia have shown satisfactory results on this plot, but recently dressings of potash applied to portion of this plot have given very substantial increases, as is shown in Table IVa.

TABLE IV.—MANURIAL TRIALS, WARRAGUL.
(*T. Boardman*).

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.	Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.							
Total Annual Yields.							
1936 ..	188	224	205	228	229	181	163
1937 ..	97	128	127	132	131	95	81
1938 ..	20	46	53	50	42	24	19
1939 ..	106	155	154	122	121	103	100

The following table shows the extent of the increases obtained during the spring of 1939 from plots receiving an additional dressing of 1 cwt. muriate of potash per acre per annum, as compared with those receiving the normal manuring.

TABLE IVA.—POTASH RESPONSE ON WARRAGUL TRIAL—SPRING, 1939.

—	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.
Yield in cwt. of Greenstuff per Acre.						
Normal Manuring	71	95	103	75	67	68
Normal Manuring + potash	87	174	130	134	152	83

R. S. Teese (Lardner).

This pasture consists of a dense cocksfoot, Yorkshire fog, subterranean clover sward which had previously been regularly top-dressed for many years.

On this pasture the No Manure plots have continued to yield almost as well as those receiving super. 2 cwt., and the lime and nitrogen treatments have not overcome this unusual condition. Dressings of potash applied to a section of this plot have shown very marked increases in the spring, and afford an explanation of the lack of response of this pasture to other fertilizers. (See Table Va.)

TABLE V.—MANURIAL TRIALS, LARDNER.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 2 cwt., Lime 1 ton.	Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.							
Total Annual Yields.							
1936 ..	235	233	232	221	226	218	208
1937 ..	121	102	120	122	113	115	102
1938 ..	27	24	37	43	34	40	28
1939 ..	105	112	119	122	119	123	103

TABLE Va.—POTASH RESPONSE AT LARDNER DURING SPRING, 1939.

—	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.						
Normal Manuring	70	73	80	79	73	81
Normal Manuring + Potash	110	169	144	158	180	119

C. Tyssen (Warragul).

This plot is situated near the old Major Plot mowing area, and whilst the soil is similar to that of the old plot, the pasture is of a very different composition, consisting mainly of Yorkshire fog and danthonia with subterranean white and suckling clovers and a good deal of plantain and flat weed.

Unlike the Major mowing trial area this plot has shown a good response to super. whilst the response to lime and sulphate of ammonia has only been small.

TABLE VI.—MANURIAL TRIALS, WARRAGUL.
(*C. Tyssen, No. 2 Plot.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.	Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.							
Total Annual Yields.							
1936 ..	127	200	209	238	225	134	127
1937 ..	75	163	142	163	175	72	78
1938 ..	24	85	83	90	90	26	17
1939 ..	56	124	115	121	132	67	57

The results from exploratory dressings of muriate of potash 1 cwt. per acre applied to portion of this plot show considerable increases from the use of this fertilizer.

TABLE VIA.—POTASH RESPONSES ON NEW WARRAGUL PLOT DURING SPRING, 1939.

——	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.						
Normal Manuring	34	65	65	66	70	39
Normal Manuring + Potash	46	99	80	88	106	48

The results of the numerous trials conducted in the Warragul district indicate that the response to fertilizer is determined more by the previous history of the paddock and the present composition of the sward, rather than by the soil type. This appears to be the explanation of the conflicting opinions of local farmers as to the most effective manures for use in this district.

NEW SERIES MOWING TRIALS.—MIRBOO NORTH.

Good responses to lime when used in conjunction with superphosphate, were recorded on the original Major Plot established at Mirboo North. In 1935, new mowing plots were laid down to determine if lime would be of benefit on other pastures in the district. The results since obtained have confirmed the findings of the old Major Plot, and it has been found that lime in addition to super. has shown a good response on these new series trials. Exploratory trials with potash in this district have not shown any material response.

Mirboo North (Edney Bros., Mardan Road).

Plot situated on a pasture consisting of Yorkshire fog, cocksfoot and danthonia with some subterranean and white clovers. The results show a good response to superphosphate, and a further considerable response to lime in addition. Where used alone, or with sulphate of ammonia, lime has not effected much improvement.

TABLE VII.—MANURIAL TRIALS, MIRBOO NORTH.
(*Edney Bros.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.	Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.							
Total Annual Yields.							
1936 ..	131	228	213	239	246	152	154
1937 ..	82	142	140	177	188	82	75
1938 ..	20	63	66	93	93	26	19
1939 ..	62	189	169	240	262	81	66

Mirboo North (L. J. Austin).

This plot is situated on a pasture which was lacking in vigour, and which consisted of cocksfoot, Yorkshire fog, flat weed, and plantain, with a little red and suckling clovers.

The super. treated plots have shown better growth than the unmanured, whilst those receiving lime in addition have been still further improved. Lime alone, and lime and sulphate of ammonia have only effected a very small improvement.

TABLE VIII.—MANURIAL TRIALS, MIRBOO NORTH.
(*L. J. Austin.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.	Lime 1 ton.
Yields in cwt. of Greenstuff per Acre.							
Total Annual Yields.							
1936 ..	105	156	148	206	201	140	156
1937 ..	55	86	82	122	115	78	78
1938 ..	19	43	43	63	55	31	31
1939 ..	76	140	123	161	163	93	91

Mirboo North (G. W. Bickerton, Limonite).

This plot has usually made stronger growth than the other plots in the North Mirboo district. The pasture consists of vigorous cocksfoot,

Yorkshire fog and subterranean clover with some red and white clover. Super. has only shown a fair increase in bulk of produce, but the additional dressing of lime has given a good response.

The weights of produce obtained are shown in the following table :—

TABLE IX.—MANURIAL TRIALS, LIMONITE.
(*G. W. Bickerton.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., Lime 1 ton.	S. of A. 1 cwt., Lime 1 ton.	Lime 1 ton.
	Yields in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1936 ..	189	229	238	322	332	221	218
1937 ..	157	193	185	272	287	169	153
1938 ..	42	63	64	96	97	46	50
1939 ..	93	150	128	204	229	110	106

WESTERN DISTRICT TRIALS.

Dry weather was experienced in this area during the autumn and winter of 1939, and, as it was not until August that good rains were received, the yields during the first half of the year on most plots were very poor. Following the previous severe summer and the death of much of the perennial rye grass, cape weed became prominent in some areas and grew very strongly during the winter. In the early spring good rains occurred, and the spring growth of pastures was unusually heavy. Good manurial responses were recorded on most plots and generally they were similar to those recorded in the previous years. On most plots the response to super. alone has recently not been large, but where both super. and potash have been applied large increases have again been recorded. Plots in the Cobden district again showed particularly good responses to dressings of potash. Permission to continue the work on one of these plots was withdrawn during the year, this plot having shown a very poor response to super. but an unusually marked response to super. plus potash. In considering the results of these experiments it must be remembered that the plots are mown at intervals, the produce is entirely removed, and that there is no return of dung or urine to the plot. There is no doubt that this treatment will hasten the depletion of soil potash, but there is already ample evidence to show that a similar condition can be reached, though more slowly, under ordinary farming methods.

During the first years of the experimental work, the Western District plots showed excellent responses to superphosphate and only small responses, if any, to potash. The lighter soils gave the biggest responses in the first years, while the heavier soils showed much smaller responses. As the work has proceeded the response to superphosphate alone declined rapidly on the lighter soils whilst on the heavier soils the response was sustained much longer.

Those plots which early in their history showed some response to potash have been the first to show signs of weakening under the continued mowing. Such swards, however, quickly recovered their vigour when mixed phosphate-potash fertilizer was applied, providing the clovers had not been eliminated. At both, Cobrico and Larpent, where from their commencement the plots showed a response to potash, the swards soon weakened with the repeated cutting. At both these trials the centre section of the mowing plot area was later given an annual basal dressing of potash and these treated sections show a marked superiority in growth as compared with those receiving the normal manurial treatment. The small observational potash plots located on grazing areas in the Colac and Cobden district showed marked responses to the potash treatment during the past year.

Larpent (J. J. Rogers).

Mean Rainfall, 27·4 *inches.*—1939, 34·7 *inches.*

This plot is situated on a deep, dark sandy loam which carried a good sward of perennial rye grass and subterranean clover when the experimental plots were commenced. This plot showed signs of a marked potash deficiency from the outset and the sward declined rapidly under the repeated mowing. The plot strips receiving superphosphate only, or superphosphate and ammonia, deteriorated very rapidly, but on both the No Manure and the Superphosphate and Potash plots, the swards have maintained a satisfactory composition. In the former case the rate of depletion of soil potash has apparently not been sufficiently rapid to bring about a potash deficiency, whilst in the latter the added potash has been sufficient to compensate for the amount removed in the greenstuff. The case for superphosphate and potash on this pasture has been fully proved, but the plot is being continued, to determine the possibility of any other minerals becoming growth-limiting factors.

The yields obtained from this plot are shown in the following table:—

TABLE X.—MANURIAL TRIALS, LARPENT.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Autumn, 1 cwt. Spring.
	Yields in cwt. of Greenstuff per Acre.					
	Total Annual Yields.					
1932	98	160	168	176	194	174
1933	88	143	162	171	189	146
1934	124	185	173	175	232	191
1935	115	111	119	135	237	113
1936	104	124	126	133	233	127
1937	64	60	78	79	116	57
1938	33	36	45	48	65	33
1939	98	103	113	117	154	97

Table Xa.—Showing Spring, 1939, yields obtained from plots receiving the normal manuring and those on the centre bay which received a basal dressing of 1 cwt. per acre muriate of potash in addition.

TABLE Xa.—RESPONSE TO POTASH ON LARPENT MAJOR PLOT, SPRING, 1939.

—	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt. Potash 1 cwt.	Super. 2 cwt. Autm'n 1 cwt. Spring.
	Yields in cwt. of Greenstuff per Acre.					
Normal Manuring	65	61	69	74	102	56
Normal Manuring + Potash	101	193	145	184	161	171

Glenormiston North (K. Atkins).

Mean Rainfall, 28·9 *inches.*—1939, 35·8 *inches.*

This plot is situated on a fertile, deep clay loam having a pasture of perennial rye and subterranean clover with some Yorkshire fog. This pasture had been frequently top-dressed before the experimental plot was established, and probably as a consequence of this treatment, its response to superphosphate has only been small. More recently there has been a fair response to potash, but it would appear that this soil is sufficiently rich to withstand repeated mowing for some years without showing obvious signs of exhaustion. Neither lime nor sulphate of ammonia have effected any improvement in this trial.

TABLE XI.—MANURIAL TRIALS, GLENORMISTON NORTH.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Autumn, 1 cwt. Spring.
	Yields in cwt. of Greenstuff per Acre.					
	Total Annual Yields.					
1932	155	174	176	187	176	177
1933	115	134	137	145	143	134
1934	257	336	267	279	278	339
1935	243	284	242	250	303	281
1936	166	222	217	214	274	224
1937	120	153	153	154	198	160
1938	44	64	70	77	94	68
1939	172	230	217	224	282	231

Cudgee (E. R. Murfitt).

Mean Rainfall, 27·5 *inches.*—1939, 32·2 *inches.*

The soil is a fine, sandy loam and the pasture, typical of the well improved pastures on light land in the Cudgee district, consists of perennial rye, cocksfoot, and subterranean clover. An excellent response to superphosphate was obtained in the early years, at which time the addition of potash did not affect any further improvement. Since then, however, the response to superphosphate has declined, whilst the response to superphosphate and potash has become very marked. Both lime and sulphate of ammonia have been ineffective in increasing the annual yields on this plot.

TABLE XII.—MANURIAL TRIALS, CUDGEE.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Autumn, 1 cwt. Spring.
	Yields in cwt. of Greenstuff per Acre.					
	Total Annual Yields.					
1932	77	130	137	118	132	136
1933	88	138	146	146	170	143
1934	115	225	159	158	183	222
1935	119	136	134	139	211	147
1936	81	106	115	119	194	111
1937	50	57	68	71	114	57
1938	27	36	44	45	65	34
1939	76	88	73	86	148	68

Cobrico (N. Maskell).

Mean Rainfall, 27·5 inches.—1939, 37·0 *inches.*

This plot is situated on a soil which, though originally carrying a rather poor pasture, had been greatly improved by regular top-dressing, previous to the establishment of the plot. The pasture, which now consists of perennial rye, sweet vernal, subterranean and white clovers with Yorkshire fog and flat weed, had in its early history responded well to top-dressing with superphosphate, but at the time that the experiment was commenced, the owner considered that the response was not as good as it had been in the earlier years. From the commencement of the experiment, this pasture gave a good response to potash, while the response to superphosphate alone, has been small. Though sulphate of ammonia has usually increased growth in the early spring, its influence over the year has not been beneficial. Lime has sometimes shown a small beneficial effect on the mowing plots, and it appears to have improved growth on the grazing areas.

TABLE XIII.—MANURIAL TRIALS, COBRICO.

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Super. 2 cwt. Autumn, 1 cwt. Spring.
	Yields in cwt. of Greenstuff per Acre.					
	Total Annual Yields.					
1932	133	164	155	157	193	145
1933	81	108	136	133	174	110
1934	121	167	155	163	218	176
1935	87	107	108	120	232	111
1936	85	101	104	110	226	103
1937	85	105	108	119	175	113
1938	35	53	62	68	92	59
1939	71	92	103	111	190	97

Under the repeated mowing treatment, the sward on this plot deteriorated, and it was decided to give a basal dressing of potash to the centre section of the mowing plot area. This resulted in a marked improvement in the sward, and a large increase in growth on those strips which previously had only received super. as their normal dressing.

The following table shows the extent of the increased growth obtained on this centre bay last spring.

TABLE XIIIA.—SHOWING COMPARATIVE YIELDS OBTAINED AT COBRICO FROM PLOTS RECEIVING THE NORMAL MANURIAL TREATMENT, AND THOSE RECEIVING IN ADDITION A BASAL DRESSING OF 1 CWT. PER ACRE MURIATE OF POTASH, DURING SPRING, 1939.

—	No Manure.	Super. 2 cwt.	Super. 2 cwt., S. of A. 1 cwt.	Super. 2 cwt., S. of A. 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt. Potash 1 cwt.	Super. 2 cwt. Aut'mn 1 cwt. Spring.
	Yields in cwt. of Greenstuff per Acre.					
Yield due to—						
Normal Manuring	42	56	67	74	146	58
Normal Manuring + 1 cwt. Potash ..	68	160	151	172	211	175

NEW SERIES MOWING TRIALS.—WESTERN DISTRICT.

New mowing trials were commenced in the Colac and Cobden districts in 1935, to determine the extent of the potash deficiency which had been demonstrated in the Major Plots located in those districts.

These new plots were located on the lighter pastures in these districts, generally on soils which had earlier been regarded as being very responsive to super., but where recently the pastures did not appear to be making very satisfactory winter growth.

From the beginning most of these new plots have shown some response to potash. Where a good response to super. has been obtained, the response to potash has usually been small, but where or when the response to super. has been poor, the response to potash usually became very much more marked. Contrary to what has frequently been claimed, lime has not been found to be of any value as a substitute for potash on these deficient soils.

The following details indicate the extent of the responses which have been recorded on these new plots.

Cobden District (J. Roberts).

This plot was situated on a pasture composed of perennial rye, sub-clover, Yorkshire fog, sweet vernal, and bent grass, with some flat weed and white clover. This pasture had previously

received little or no superphosphate, but had been top-dressed with considerable quantities of stable manure.

In the first years, there was a good response to super., and a further response to potash in addition. More recently the super. response has declined, and the potash response has increased. Sulphate of ammonia has not given increased yields, but lime applied to plots receiving super. and potash, has shown some increase in growth.

TABLE XIV.—MANURIAL TRIALS, COBDEN.
(*J. Roberts.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Lime 1 cwt.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Potash 1 cwt.
	Yields in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1935 ..	91	128	164	118	155	127	96
1936 ..	104	200	266	201	275	258	115
1937 ..	78	106	186	123	201	172	102
1938 ..	45	68	132	81	142	132	51
1939 ..	81	123	271	123	275	234	86

Cobden (L. Vagg).

This pasture, consisting mainly of perennial rye with sub and white clover, has usually made strong growth and at first did not appear to be suffering from any unusual manurial deficiency.

It has shown a very good response to super., which for a time was well sustained. In the first years the response to potash on this plot was not large, but more recently it has become much greater and very substantial responses were recorded last year.

Neither lime nor sulphate of ammonia have shown any beneficial effect on this plot. (See Table XV.)

Cobden (Plot No. 3).

The pasture on this plot consists of perennial rye, subterranean and white clovers, with Yorkshire fog, sweet vernal, and flat weed. The soil is typical of the shallow basalt soils found in the Cobden district, and the results, which were obtained from this plot in 1939, indicate that it has reached an extreme stage of potash deficiency. No doubt the deficiency on this area has been accentuated by the repeated mowing, but the results during the past year were so striking, that the farmer withdrew permission to carry on this plot.

TABLE XV.—MANURIAL TRIALS, COBDEN.
(*L. Vagg.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Lime 1 ton.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Potash 1 cwt.
	Yields in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1935 ..	174	215	239	216	236	214	173
1936 ..	157	257	300	258	284	282	146
1937 ..	133	205	270	211	260	246	119
1938 ..	61	148	197	155	200	190	68
1939 ..	87	198	317	193	310	289	93

This pasture had been developed by repeated annual dressings of superphosphate, and when the work was commenced, had reached a stage when the response to superphosphate had declined. The experimental plot has confirmed this lack of response to superphosphate, and it has been found, that unless potash is also applied, the superphosphate alone is comparatively ineffective.

Although marked responses to the potash treatment have been obtained, neither lime nor sulphate of ammonia have been of any benefit. (See Table XVI.)

TABLE XVI.—MANURIAL TRIALS, COBDEN,
(PLOT NO. 3.)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Lime 1 ton.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Potash 1 cwt.
	Yields in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1935 ..	104	125	167	115	156	147	142
1936 ..	136	153	266	150	258	239	178
1937 ..	103	106	200	107	204	200	142
1938 ..	57	69	123	69	142	132	75
Incomplete 1939	13	25	107	22	129	115	31

Cobden (J. Errey)

This plot is situated on the light grey buckshot basalt soil. The pasture consists of sweet-vernal, perennial rye, Kentucky blue, with white, subterranean, and suckling clovers, and

a good deal of flat weed. This pasture had been developed by regular supering, but as a result of grass hay cutting the productivity had declined.

Superphosphate alone has effected little improvement as compared with the unmanured plots, and the addition of lime did not improve the response. Superphosphate and potash, however, have effected a big improvement in the pasture, and the addition of lime to this combination has made a further improvement. It is evident that the use of superphosphate alone on soils which have reached this stage of depletion can only give indifferent results, and that a combined superphosphate and potash fertilizer should be used.

TABLE XVII.—MANURIAL TRIALS, COBDEN.
(*J. Errey.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Lime 1 ton.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Potash 1 cwt.
	Yields in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1935 ..	64	75	95	66	101	110	86
1936 ..	97	120	219	113	253	226	144
1937 ..	84	98	158	96	184	175	127
1938 ..	46	59	101	51	127	124	65
1939 ..	96	101	215	96	245	215	150

Colac West (J. McRae).

The soil of the Colac West plot consists of a deep, sandy loam with a pasture of perennial rye and subterranean clover, with some Danthonia flat weed and cape weed. The pasture had previously not been top-dressed and the Danthonia still persists on the unmanured strips, but has been crowded out on the manured strips.

This plot has shown a very good response to superphosphate and a further good response to potash in addition. Neither lime nor sulphate of ammonia, have been of any benefit on this plot when used with superphosphate only, but lime has been of some value when used in addition to superphosphate and potash.

TABLE XVIII.—MANURIAL TRIAL, COLAC WEST.
(*J. McRae.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Lime 1 ton.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Potash 1 cwt.
	Yields in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1935 ..	82	163	187	158	180	174	90
1936 ..	125	293	359	298	341	317	139
1937 ..	74	133	167	140	169	158	78
1938 ..	32	69	96	74	117	97	36
1939 ..	117	203	308	224	370	277	132

Larpent (N. Watchorn).

This pasture consists of perennial rye, Yorkshire fog, and subterranean clover, together with some flat weed, and suckling clovers. The soil is a deep, sandy loam, and at the commencement of the experiment was supporting a vigorous pasture. During the autumn before the work was begun, the pasture had received a top-dressing of 1½ cwt. superphosphate per acre, and in the first year the "unmanured" and treated strips all yielded about equal amounts of produce. In the following year, however, a response to superphosphate was apparent, and since then the response to superphosphate and potash has become the most marked feature of these plots.

Neither lime nor sulphate of ammonia have effected any appreciable improvement.

TABLE XIX.—MANURIAL TRIALS, LARPENT.
(*N. Watchorn.*)

Year.	No Manure.	Super. 2 cwt.	Super. 2 cwt., Potash 1 cwt.	Super. 2 cwt., Lime 1 ton.	Super. 2 cwt., Potash 1 cwt., Lime 1 ton.	Super. 2 cwt., S. of A. 1 cwt., Potash 1 cwt.	Potash 1 cwt.
	Yield in cwt. of Greenstuff per Acre.						
	Total Annual Yields.						
1935 ..	107	111	117	111	117	116	106
1936 ..	173	244	301	235	278	270	188
1937 ..	130	175	233	172	257	219	150
1938 ..	34	64	128	60	140	123	40
1939 ..	165	242	365	221	367	361	191

The remainder of this report dealing with North-East and Lilydale districts new pasture experiments, and also the irrigated pasture trials in the Northern district, will appear in a subsequent issue of the Journal of Agriculture.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
State Research Farm	Werribee	211	Gorman, A. W. ..	"Cathcart," Alexandra	64
Payne, A. E. T. ..	"Yarra View," Lilydale	77	Samuel, B. T. ..	Lang Lang ..	60
Dennis, Mrs. A. A. ..	Frankston	19	Powell, T. S. ..	"Carellen," Mansfield	41
Reid, Ralph G. ..	"Holmwood," Kooweerup	78	Dunbar and Clark, Messrs.	"Hazeldean Dairy," Mount Dandenong	15
School of Horticulture	Burnley	6	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	31
Lawrence, P. H. ..	"Rainga," Tarrawarra	60	Onley, W. H. ..	"Glenholme," Caldermeade	67
Banyule Stud Pty. Ltd.	Heidelberg	34	Payne, T. E. N. ..	"Woodburn," Kilmore	58
Black, Miss Grace ..	Mount Noorat ..	35	Holloway, R. W. ..	Caldermeade ..	57
Black, Estate, Late I. S.	"The Cottage," Mount Noorat	46	Dookie Agricultural College	Dookie	81
Read, Estate, Late John D.	"Springhurst Estate," Springhurst	112			
Kelly, C.	"Glenmore," Creighton's Creek, Euroa	17			

In addition to the above-mentioned herds there are 100 commercial dairy herds containing 3,016 head of cattle which may be considered free of tuberculosis. All the cattle in these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 79 herds in which 3,678 head of cattle have passed one test, and may be considered therefore to be in process of becoming tuberculosis free herds.

Christmas Mails

The Post Office plays an important role in the treatment and disposal of Christmas mail and the Deputy Director, Posts and Telegraphs (Mr. R. N. Partington) is seeking the co-operation of all readers in regard to the posting of Christmas Gifts and Greetings. He would like such mail matter posted as early as possible and not later than Tuesday, the 17th December, and suggests that packets be endorsed "Do not open until Christmas." By doing this, readers will materially assist the Postal Department and eliminate any possibility of their gifts and greetings not being delivered in time. If postings are not made until the last three days before Christmas, the congestion may prevent the postal staffs from effecting delivery before the 25th December.

The charm of a gift or greeting lies in its receipt before Christmas Day, so do your shopping now, pack securely, address fully and plainly, and Post Early to avoid disappointment to your relatives and friends.

Registered Fertilizers

Analyses and Unit Values

Fertilizers Act 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1940.

	£	s.	d.
Nitrogen, organic, as Blood; Blood and Bone; Blood, Bone, and Flesh; and Fine Bone ..	1	0	0
„ as Coarse Bone and in Bone Fertilizers	0	18	6
„ as Nitrate	0	17	4
„ as Ammonia	0	12	4
Phosphoric Acid—			
as Water Soluble	0	3	7
as Citrate Soluble—			
in Blood and Bone and Animal Fertilizers and in Mixed and Complete Fertilizers containing either or both of the foregoing	0	4	6
in all other Fertilizers	0	3	0
as Citrate Insoluble—			
in Blood and Bone and Animal Fertilizers, and in Mixed and Complete Fertilizers containing either or both of the foregoing	0	3	6
in other Mixed Fertilizers and in Ground Phosphate	0	2	2
in other Fertilizers	0	1	0
as Fine Bone	0	4	6
as Coarse Bone	0	4	0
Potash—			
as Sulphate	0	6	4
as Chloride	0	5	4

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

Melbourne, 2nd December, 1939.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1940.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Nitrogenous—Readily Available.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrate of Soda	Sickle in diamond	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco ..	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	Cresco Fertilizers Ltd., Geelong
„ „	Pivot ..	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Champion ..	16·00	..	..	..	..	16·00	..	..	..	..	..	13 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „	Pratt's Champion	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	T. D. Pratt and Co. Pty. Ltd., Victoria Market, Melbourne
Sulphate of Ammonia	M.G. Co. in diamond	..	20·59	..	..	..	20·59	..	..	..	..	..	12 14 6	The Metropolitan Gas Co., 196 Flinders-st., Melbourne
„ „	Pivot ..	..	20·60	..	..	..	20·60	..	..	..	..	..	12 14 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Sickle in diamond	..	20·60	..	..	..	20·60	..	..	..	..	..	12 14 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco ..	..	20·60	..	..	..	20·60	..	..	..	..	..	12 14 6	Cresco Fertilizers Ltd., Geelong
Nitro Chalk† ..	Sickle in diamond	7·75	7·75	..	..	..	15·50	..	..	..	..	..	12 8 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne

† This fertilizer contains approximately 50 per cent. Lime.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3630) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Nitrogenous—Moderately Available.																
Dried Blood ..	Fitzroy ..	..	..	13·00	..	..	13·00	..	..	..	..	..	12	0	0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
„ „ ..	T.B. & S. in diamond—Brooklyn	..	..	12·00	..	..	12·00	..	..	..	..	..	13	10	0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
„ „ ..	M.C.C. ..	..	..	11·50	..	..	11·50	..	..	..	..	..	10	0	0	Melbourne City Council, Town Hall, Melbourne
„ „ ..	Pannifex's ..	..	..	12·00	..	..	12·00	..	..	..	..	..	12	10	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „ ..	Pannifex's Blood Flour	..	..	13·00	..	..	13·00	..	..	..	..	..	12	10	0	
„ „ ..	Sickle in diamond, No. 2	..	..	12·75	..	..	12·75	..	..	..	..	..	12	10	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Blood Manure .	Nifex ..	..	..	7·50	..	..	7·50	..	..	..	..	..	8	10	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „ ..	Pentagon ..	..	..	8·13	..	..	8·13	..	2·07	1·13	3·20	..	9	10	0	Western District Tallow Pty. Ltd., North-rd., East Oakleigh
Slowly Available.																
Castor Meal ..	Alba ..	..	..	..	..	.	4·50 (as castor meal)	..	..	2·25	2·25	0·75	4	5	0	Lycett Proprietary Ltd., Normanby-road, Montague
„ „ ..	Pannifex's ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „ ..	Sweetsoil ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Sweetsoil Lime and Fertilizers Pty. Ltd., 17 Queen-st., Melbourne
„ „ ..	L.F.X. ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Rape Seed Meal	Alba ..	..	..	..	..	..	5·50 (as rape seed meal)	..	..	1·75	1·75	1·50	5	5	0	Lycett Proprietary Ltd., Normanby-road, Montague
Wool Waste ..	A.L.T. ..	..	..	..	..	..	3·85 (as wool)	..	..	·70	·70	·31	2	15	0	A. L. Thompson Pty. Ltd., 49 Grant-st., South Melbourne
Nitrogenous Fertilizer	Pennell's ..	..	..	..	..	..	8·00 (as hoof and treated leather)	..	..	..	..	..	8	0	0	Est. G. W. Pennell, Burke-st., Braybrook
Phosphatic—Readily Available.																
Superphosphate 22 per cent.	Cresco ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	Cresco Fertilizers Ltd., Geelong
„ „	Sickle in diamond	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Pivot ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Lamaco ..	..	..	..	..	..	..	20·50	50	1·00	22·00	..	3	15	0	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-st., Melbourne
„ „	Cockbill's ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	W. and J. Cockbill (trading as J. Cockbill), 407 Post Office-place, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3080) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Phosphate—Moderately Available.																
Basic Phosphate	Sickle in diamond	..	..	..	..	..	..	..	15·50	3·20	18·70	..	4	15	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	..	15·50	3·00	18·50	..	4	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Super. and Rock Phosphate	Pivot ..	..	..	..	..	..	..	10·00	·50	18·50	29·00	..	4	5	0	,, ,, ,,
,, ,,	Cresco 50·50 Phosphate	..	..	..	..	..	..	9·16	1·84	17·40	28·40	..	4	5	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Sickle in diamond	..	..	..	..	..	..	10·00	·50	18·50	29·00	..	4	5	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Slowly Available.																
Ground Phosphate	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	36·65	36·65	..	4	0	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	36·50	36·50	..	3	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot (very fine)	..	..	..	..	..	..	..	..	36·50	36·50	..	4	0	0	,, ,, ,,
Potassic—Readily Available.																
Sulphate of Potash	Cresco ..	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	Cresco Fertilizers Ltd., Geelong
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Sickle in diamond (90%)	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pannifex's ..	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Sun	..	..	..	..	..	..	..	..	..	..	48·6	15	7	6	Mildura Co-op. Fruit Packing Co. Ltd., Mildura
Muriate of Potash	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	13	7	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Cresco ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	13	7	6	Cresco Fertilizers Ltd., Geelong
,, ,,	Pannifex's ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	13	7	6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	13	7	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Containing Nitrogen and Phosphoric Acid—Readily Available.																
Super. and Ammonia	Cresco (1 and 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	8	16	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco (2 and 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	7	7	0	,, ,, ,,
,, ,,	Cresco (3 and 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	6	12	0	,, ,, ,,
,, ,,	Cresco (6 and 1)	..	2·85	..	..	..	2·85	17·48	·42	·85	18·75	..	5	13	6	,, ,, ,,
,, ,,	Pivot III. ..	..	10·00	..	..	..	10·00	10·20	·20	·50	10·90	..	8	16	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Containing Nitrogen and Phosphoric Acid—Readily Available—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Super. and Ammonia	Pivot II. (A) ..	..	6·80	..	..	..	6·80	13·60	·30	·60	14·50	..	7 7 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot II. ..	..	5·00	..	..	..	5·00	15·30	·30	·80	16·40	..	6 12 0	,, ,, ,,
,, ,,	Pivot I. ..	..	2·90	..	..	..	2·90	17·40	·40	·80	18·60	..	5 13 6	,, ,, ,,
,, ,,	Sickle in diamond (1 and 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	8 16 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (2 and 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	7 7 0	,, ,, ,,
,, ,,	Sickle in diamond (3 and 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	6 12 0	,, ,, ,,
,, ,,	Sickle in diamond (6 and 1)	..	2·90	..	..	..	2·90	17·50	·40	·90	18·80	..	5 13 6	,, ,, ,,
,, ,,	Pannifex (1 & 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	8 16 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pannifex (2 & 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	7 7 0	,, ,, ,,
,, ,,	Pannifex (3 & 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	6 12 0	,, ,, ,,
,, ,,	Pannifex (6 & 1)	..	2·90	..	..	..	2·90	17·50	·40	·90	18·80	..	5 13 6	,, ,, ,,
Nitro Superphosphate	Sickle in diamond	..	1·50	..	..	0·50	2·00	16·70	1·10	2·00	19·80	..	6 0 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne.
,, ,,	Cresco ..	..	1·50	..	·50	..	2·00	16·39	1·10	1·70	19·19	..	6 0 0	Cresco Fertilizers Ltd., Geelong
Moderately Available.														
Ammonia and Phosphate	Cresco ..	..	2·00	..	..	..	2·00	8·30	1·60	15·70	25·60	..	5 7 6	,, ,, ,,
,, ,,	Sickle in diamond	..	2·00	..	..	..	2·00	8·20	·20	18·90	27·30	..	5 7 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Blood, Bone, and Super.	Sickle in diamond	..	..	..	..	2·50	2·50	12·51	1·43	2·96	16·90	..	6 12 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Cockbill's ..	..	..	..	2·50	..	2·50	12·51	1·43	2·96	16·90	..	8 7 6	W. and J. Cockbill (trading as J. Cockbill), 407 Post Office-place, Melbourne
,, ,,	Pannifex's ..	..	..	..	..	2·50	2·50	10·25	3·25	4·00	17·50	..	6 12 6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Bone and Super.	Dundas' ..	..	..	..	..	2·25	2·25	9·99	5·16	5·58	20·73	..	7 10 0	J. A. Dundas, Dynon-rd., Footscray
,, ,,	Sickle in diamond, No. 1	..	..	..	..	2·00	2·00	11·40	3·00	5·30	19·70	..	6 15 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	G.B.P. ..	..	..	..	1·72	..	1·72	10·00	6·00	6·00	22·00	..	6 17 6	Gippsland Bone Products, Ronchi Bros., Raymond-st., Sale
,, ,,	Cresco No. 1 ..	..	..	..	2·00	..	2·00	9·50	3·90	3·00	16·40	..	6 15 0	Cresco Fertilizers Ltd., Geelong
,, ,,	Pannifex's ..	..	..	..	..	1·75	1·75	10·25	4·25	5·50	20·00	..	6 15 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Super. and Bone	Cresco No. 2 ..	..	..	..	..	1·00	1·00	16·10	1·10	3·60	20·80	..	5 17 6	Cresco Fertilizers Ltd., Geelong
,, ,,	Sickle in diamond, No. 2	..	..	..	..	1·00	1·00	17·00	1·40	1·90	20·30	..	5 17 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pannifex's ..	..	..	..	..	·90	·90	15·25	2·25	3·50	21·00	..	5 17 6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Mixed Fertilizer	Pennell's ..	..	..	..	..	5·5 (as bone meat and skin)	5·50	1·00	3·50	7·50	12·00	..	7 10 0	G. W. Pennell, Braybrook

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen and Phosphoric Acid—Moderately Available — continued.														
Blood and Bone	Sickle in diamond	..	..	..	..	5·00	5·00	..	5·00	9·00	14·00	..	8 0 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Sickle in diamond (No. 2)	..	..	..	..	7·25	7·25	..	6·00	7·00	13·00	..	9 10 0	„ „ „
„ „	J. A. Dundas'	..	..	..	..	4·50	4·50	..	7·14	13·61	20·75	..	8 0 0	J. A. Dundas, Dynon-rd., Footscray
„ „	Corio ..	..	..	..	4·00	..	4·00	..	6·00	8·00	14·00	..	6 10 0	The Corio Trading Co. Pty. Ltd., 164 Moorabool-street, Geelong
„ „	Cockbill's ..	..	..	..	..	5·25	5·25	..	2·00	8·00	10·00	..	9 10 0	W. and J. Cockbill (trading as J. Cockbill), 407 Post Office-place, Melbourne
„ „	Fitzroy ..	..	..	..	5·00	..	5·00	..	6·00	12·00	18·00	..	7 10 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
„ „	W. & M. in circle	..	..	..	5·25	..	5·25	..	4·00	7·00	11·00	..	6 15 0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
„ „	Pridham's ..	..	..	..	5·10	..	5·10	..	6·00	8·00	14·00	..	7 15 0	W. Pridham Pty. Ltd., Evans-st., Braybrook
„ „	Ibis	..	..	..	..	5·00	5·00	..	6·00	6·00	12·00	..	7 0 0	Ficken, Halliday and McClelland Pty. Ltd., 634 Bourke-st., Melbourne
„ „	P.M. ..	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	9 0 0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne
„ „	Solo ..	..	..	..	..	7·00	7·00	..	4·25	10·75	15·00	..	9 0 0	„ „ „
„ „	Cockatoo ..	..	..	..	4·56	..	4·56	..	5·90	5·88	11·78	..	6 10 0	R. Fordham, Cressy-rd., Camperdown
„ „	Champion No. 2	..	..	..	7·00	..	7·00	..	3·20	10·20	13·40	..	9 0 0	Sims Cooper (Freezing Works) Pty. Ltd., Henty House, 499 Lit. Collins-st., Melbourne
„ „	Champion No. 4	..	..	..	6·50	..	6·50	..	6·50	7·50	14·00	..	8 10 0	„ „ „
„ „	Fitzgerald's ..	..	..	..	5·00	..	5·00	..	5·25	9·75	15·00	..	7 10 0	P. Fitzgerald and Sons, Oakleigh
„ „	T.B. and S. in diamond (Lighthouse)	..	..	..	5·50	..	5·50	..	4·00	11·00	15·00	..	8 10 0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
„ „	T.B. and S. in diamond No. 1 (Brooklyn)	..	..	..	5·75	..	5·75	..	5·75	6·00	11·75	..	8 10 0	„ „ „
„ „	T.B. and S. in diamond No. 2 (Brooklyn)	..	..	..	5·00	..	5·00	..	6·00	10·00	16·00	..	8 10 0	„ „ „
„ „	Apex ..	..	..	..	..	5·00	5·00	..	5·00	10·00	15·00	..	7 10 0	North-Eastern Bone Products, Wangaratta
„ „	Fitzgerald's (animal fertilizer)	..	..	..	3·75	..	3·75	..	5·75	13·25	19·00	..	7 10 0	P. Fitzgerald and Sons, Oakleigh
„ „	Pannifex's No. 1	..	..	..	..	5·50	5·50	..	6·00	8·00	14·00	..	7 15 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„ „	Pannifex's No. 2	..	..	..	..	7·00	7·00	..	5·00	6·00	11·00	..	9 0 0	„ „ „
„ „	Pannifex's No. 3	..	..	..	..	5·50	5·50	..	5·00	10·00	15·00	..	8 0 0	„ „ „
„ „	Pannifex's No. 4	..	..	..	..	6·00	6·00	..	5·00	7·00	12·00	..	8 0 0	„ „ „
„ „	Pannifex's No. 5	..	..	..	..	8·00	8·00	..	3·00	5·00	8·00	..	9 0 0	„ „ „
„ „	Pannifex's No. 6	..	..	..	..	6·00	6·00	..	6·00	10·00	16·00	..	8 10 0	„ „ „
„ „	Pannifex's No. 7	..	..	..	..	4·00	4·00	..	7·00	9·00	16·00	..	7 15 0	„ „ „
„ „	Pannifex's No. 8	..	..	..	..	4·50	4·50	..	6·00	10·00	16·00	..	7 15 0	„ „ „
„ „	Pannifex's No. 9	..	..	..	..	7·00	7·00	..	4·00	5·00	9·00	..	9 0 0	„ „ „
„ „	Pannifex's No. 10	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	9 0 0	„ „ „
„ „	Pannifex's No. 11	..	..	..	5·00	..	5·00	..	4·00	6·00	10·00	..	7 15 0	„ „ „

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£. s. d.	
Containing Nitrogen and Phosphoric Acid—Moderately Available—continued.														
Blood and Bone	Pannifex's No. 14	..	..	..	..	5·00	5·00	..	6·00	8·00	14·00	..	7 15 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" "	Pannifex's No. 15	..	..	..	..	7·00	7·00	..	6·00	8·00	14·00	..	9 0 0	" " "
" "	Cresco ..	..	..	..	..	7·00	7·00	..	6·50	7·50	14·00	..	9 10 0	Cresco Fertilizers Ltd., Geelong
" "	Bendigonian in circle	..	..	..	4·50	..	4·50	..	5·00	10·50	15·50	..	7 10 0	Bendigo Fertilizer and Wool Co. Pty. Ltd., View Point, Bendigo
" "	Tongala ..	..	..	..	..	4·38	4·38	..	6·25	6·84	13·09	..	7 0 0	L. L. Russell and Son, Tongala
" "	Sayer ..	..	..	..	3·80	..	3·80	..	8·20	9·90	18·10	..	8 10 0	Sayer Co. (Aust.) Pty. Ltd., Laverton
" "	Valley ..	..	..	..	..	5·09	5·09	..	3·44	4·23	7·67	..	6 10 0	Goulburn Valley Freezing Works, Shepparton
" "	Sidney Lyall's	..	..	..	..	5·0	5·00	..	6·00	8·00	14·00	..	7 10 0	Sidney Lyall, Victoria Market, Melbourne
" "	M.S.C. ..	..	..	..	5·50	..	5·50	..	4·50	6·00	10·50	..	7 12 0	Mildura Shire Council, Mildura
" "	Arch No. 1 ..	..	..	..	7·00	..	7·00	..	4·50	3·50	8·00	..	8 0 0	Amalgamated Freezing Co. (Vic.) Pty. Ltd., 54 Market-st., Melbourne
" "	Arch No. 2 ..	..	..	..	6·50	..	6·50	..	3·50	3·50	7·00	..	8 0 0	" "
Animal Fertilizer	Fertillo ..	..	..	..	..	6·00	6·00	..	6·00	9·00	15·00	..	8 15 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
" "	A.N.A. Surprise	..	..	..	..	5·00	5·00	..	4·00	10·00	14·00	..	8 0 0	G. W. Pennell, Burke-st., Braybrook
Bone Fertilizer	Newnham's ..	..	..	..	..	..	2·28 (as bone)	..	6·86	16·72	23·50	..	5 10 0	Newnham Pty. Ltd., Box 8, P.O., Sale
Containing Phosphoric Acid and Potash—Readily Available.														
Super. and Potash	Sickle in diamond (S.P. Super. Potash)	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	6 15 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Sickle in diamond (S.P. Super. Potash) No. 2	..	..	..	..	..	..	13·66	·34	·66	14·66	16·50 (as muriate)	7 10 0	" " "
" "	Pivot IX. ..	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	6 15 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Pivot VII. ..	..	..	..	..	..	..	13·60	·30	·60	14·50	16·60 (as muriate)	7 10 0	" " "
" "	Pivot VIII. ..	..	..	..	..	..	..	10·20	·20	·50	10·90	25·00 (as muriate)	9 2 6	" " "
" "	Pannifex's ..	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	6 15 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne, C.1
" "	Pannifex's Special	..	..	..	..	..	..	13·60	·30	·60	14·50	16·50 (as muriate)	7 10 0	" " "
" "	Cresco (3 and 1)	..	..	..	..	..	..	15·38	·37	·75	16·50	12·5 (as muriate)	6 15 0	Cresco Fertilizers Ltd., Geelong

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
Containing Nitrogen, Phosphoric Acid and Potash		%	%	%	%	%	%	%	%	%	%	%				
Complete Manure	Sickle, No. 1 ..	..	1·00	..	..	1·40	2·40	12·50	1·70	2·10	16·30	5·00 (as muriate)	7	10	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond, No. 2	..	1·00	..	..	1·00	2·00	14·80	·40	·70	15·90	4·80 (unspecified)	7	2	6	,, ,, ,,
,, ,,	Sickle in diamond (Market Garden)	..	1·70	..	..	1·50	3·20	11·50	2·50	3·10	17·10	2·42 (unspecified)	7	17	6	,, ,, ,,
,, ,,	Sickle in diamond (A) (5.1.1.)	..	2·90	..	..	..	2·90	14·60	·40	·70	15·70	6·90 (unspecified)	7	6	0	,, ,, ,,
,, ,,	Sickle in diamond (B) (5.2.1.)	..	5·00	..	..	..	5·00	12·80	·30	·60	13·70	6·00 (unspecified)	8	5	0	,, ,, ,,
,, ,,	Sickle in diamond (C) (4.4.1.)	..	9·15	..	..	..	9·15	9·11	·22	·44	9·77	5·39 (unspecified)	9	14	6	,, ,, ,,
,, ,,	Sickle in diamond (D) (2.2.1.)	..	8·24	..	..	..	8·24	8·20	·20	·40	8·80	10·00 (unspecified)	10	5	0	,, ,, ,,
,, ,,	Pivot IV. ..	..	2·90	..	..	..	2·90	14·30	·30	·70	15·30	6·90	7	6	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot V. ..	..	8·20	..	..	..	8·20	8·20	·20	·40	8·80	9·60	10	5	0	,, ,, ,,
,, ,,	Pivot VI. ..	..	9·10	..	..	..	9·10	9·10	·20	·40	9·70	5·36	9	14	6	,, ,, ,,
,, ,,	Cresco No. 1 ..	..	1·00	..	1·40	..	2·40	11·25	2·00	4·50	17·75	5·00	7	10	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco (Market Garden)	..	1·50	..	1·56	..	3·06	11·65	1·49	3·26	16·40	2·42	7	17	6	,, ,, ,,
,, ,,	Cresco, No. 2 ..	..	9·15	..	..	..	9·15	9·11	·22	·44	9·77	5·31	9	14	6	,, ,, ,,
,, ,,	Cresco, No. 3 ..	..	5·15	..	..	..	5·15	12·81	·31	·63	13·75	6·06	8	5	0	,, ,, ,,
,, ,,	Cresco, No. 4 ..	..	8·24	..	..	..	8·24	8·20	·20	·40	8·80	10·00 (as muriate)	10	5	0	,, ,, ,,
,, ,,	Pannifex's No. 1	..	1·00	..	..	1·40	2·40	12·50	1·70	2·10	16·30	5·00 (as muriate)	7	10	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pannifex's No. 2	..	1·00	..	..	1·00	2·00	14·80	·40	·70	15·90	5·00 (as muriate)	7	2	6	,, ,, ,,
,,	Pannifex's No. 3	..	2·90	..	..	..	2·90	14·60	·40	·70	15·70	7·00 (as muriate)	7	6	0	,, ,, ,,
,, ,,	Pannifex's No. 4	..	5·00	..	..	..	5·00	12·80	·30	·60	13·70	6·00 (as muriate)	8	5	0	,, ,, ,,
,, ,,	Pannifex's No. 5	..	9·10	..	..	..	9·10	9·10	·20	·40	9·70	5·50 (as muriate)	9	14	6	,, ,, ,,
,, ,,	Pannifex's ..	..	8·24	..	..	..	8·24	8·20	·20	·40	8·8	10·00 (as muriate)	10	5	0	,, ,, ,,
,, ,,	Pannifex's (Potash and Blood and Bone)	..	..	..	..	4·00	4·00	..	5·00	6·00	11·00	9·75 (as muriate)	10	10	0	,, ,, ,,
,, ,,	Pannifex's (Market Garden)	..	1·70	..	..	1·50	3·20	11·50	2·50	3·00	17·00	2·40 (as muriate)	7	17	6	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1940—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust ..	Pannifex's No. 1	1·00	30·00	95·0	5·0	8 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" ..	Pannifex's No. 2	3·50	19·00	50·0	50·0	8 5 0	" " " " "
" ..	G.B.P. ..	3·44	24·00	65·0	35·0	8 10 0	Gippsland Bone Products, Raymond-st., Sale
" ..	Mount Clear ..	3·00	19·00	50·0	50·0	6 15 0	Bailey Bros., 6 Sturt-st., Ballarat
" ..	Nuelife ..	3·50	22·00	50·0	50·0	7 15 0	E. F. Peters and Sons Pty. Ltd., Dunolly
" ..	Pioneer ..	4·07	22·01	50·0	50·0	7 10 0	W. A. Rainey, Mepunga East
" ..	Apex ..	3·25	20·00	50·0	50·0	7 10 0	North-Eastern Bone Products, Wangaratta

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

Melbourne, 2nd December, 1939.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	190	12	Read, John D. ..	"Springhurst Estate," Springhurst	99
2	Warragul High School	Warragul ..	35				
3	Payne, A. E. T. ..	"Yarra View," Lilydale	80	13	Kelly, C. ..	"Glenmore," Creighton's Creek, Euroa	22
4	Dennis, Mrs. A. A. ..	Frankston ..	14				
5	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	99	14	Gorman, A. W. ..	"Cathcart," Alexandra	64
6	School of Horticulture	Burnley ..	6				
7	Lawrence, P. H. ..	"Rainga," Tarrawarra	59	15	Samuel, B. T. ..	Lang Lang ..	72
				16	Powell T. S. ..	"Carellen," Mansfield	48
8	Banyule Stud Pty. Ltd.	Heidelberg ..	54				
9	McIntosh, John ..	"Burnwood," Merrigum	31	17	Dunbar & Clark, Messrs.	"Hazeldean Dairy" Mount Dandenong	16
10	Black, Mrs. Agnes ..	Mount Noorat	40				
11	Black, Estate, Late I. S.	"The Cottage," Mount Noorat	44				

T. RIDER, Government Printer, Melbourne.

DEPARTMENT OF AGRICULTURE

VICTORIA, AUSTRALIA

Tomato Varieties in Victoria

Descriptive List

Standard Herd Records

For Quarter Ending December, 1939

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A Descriptive List of most of the Tomato Varieties that have been Grown in Victoria

In a previous article, tomatoes of outstanding merit in Victoria were discussed and divided into three groups, namely, Chinese Types, Globe or Canning Types, and Dessert or Cluster Types. This was done for commercial purposes, but in order to describe a number of additional varieties, a fourth group, viz., Ornamental Types has been added.

For classification and ready reference it is necessary that the four groups be described here :—

Chinese Type.—Means the flat crinkled or corrugated varieties, somewhat rough in appearance. The Australian Large Red and Burwood Wonder are examples.

Globe or Canning Type.—Means the smooth round, oval, or slightly flat shaped varieties which normally produce medium to large size fruit without forcing. Red Marhio and Marglobe are examples. Where the colour of the flesh is detrimental for canning, the word " Globe " only is used.

Dessert or Cluster Type.—Means those smooth round, but normally small varieties which produce their fruit in comparatively large clusters and require to be heavily pruned and artificially forced for best results. Recruit and Kondine Red are examples.

Ornamental Type.—Means those miniature varieties from about the size of a small cherry to the size of a plum. The Red Cherry and the Yellow Pear varieties are examples. This is an additional type which is included in this list ; they are only of minor importance commercially.

Although many varieties of tomatoes have been grown, few can be recommended. Some varieties are satisfactory under certain conditions, but they are not so satisfactory under other conditions. Reference should be made to the special lists on other pages before deciding to plant, although some of the varieties in this list which are not included in the special lists may be quite satisfactory.

" Catface " is a term used to describe a rough, irregular surface, more or less corrugated and uneven.

The market of to-day demands a tomato with a bright-red coloured flesh. Many excellent varieties in this list are obsolete for no other reason than the pink or purple colour of the flesh.

A tomato plantation in southern Victoria.

A DESCRIPTIVE LIST OF MOST OF THE TOMATO VARIETIES THAT HAVE BEEN GROWN IN VICTORIA—*continued.*

Variety.	Type.	Comparative Size and Shape of Fruit.	Cropping Habit.	Colour of Fruit.	Season.	Habit of Plant.	Method of Growing.	Remarks.
Ailsa Craig	Dessert or cluster	Small, smooth, round	Good	Bright-red	2nd early	Tall	Single leader on stakes	Useful variety in its class for heated glass-houses. Manure heavily and thin or shorten the clusters as soon as the fruit sets
Australian Large Red (old type)	Chinese	Large, flat, and badly crinkled	Good	Bright-red	2nd early	Tall	Without pruning, and in the bush form	Produces too many deformed fruits; not recommended. For improved type see Bendigo Large Red
Abundance	Dessert or cluster	Small, flat, crinkled	Good	Red	2nd early	Tall	Single leader on stakes	Not recommended; frequently is roughly corrugated; poor quality
Acme	Globe	Large, smooth, round, slightly flat	Medium	Purple flesh	2nd early	Medium	Staking and pruning optional	Solid flesh, slicing variety of good quality. Grown extensively in South Australia before the introduction of the South Australian Dwarf. Fell into disfavour because of purple colour of flesh which is undesirable for factory purposes
Atlantic Prize	Dessert or cluster	Small, slightly flat	Good	Bright-red	1st early	Tall	Single leader on stakes	Produces many rough fruits. Not recommended
Australian Dwarf	Chinese	Large, flat, crinkled	Good	Bright-red	2nd early	Dwarf	In the bush form without pruning	Is somewhat similar to South Australian Dwarf. Good variety in Dimboola district
Antibes	Dessert or cluster	Small, smooth, round, flat	....	Bright-red	....	....	Single leader on stakes	New variety from Europe being tested. Reported to be early and resistant to spotted wilt
Australian Earlianer	Globe or canning	Large, slightly flat, smooth, round	Medium	Pale-red	1st early	Tall	Staking and pruning optional. Bush form in northern districts	Splits badly if forced, and subject to "catfaces." A strain of the old Earlianer. See Sunnybrook Earlianer
Bendigo Large Red	Chinese	Large, flat, crinkled	Good	Bright-red	2nd early	Medium	In the bush form without pruning	A selected strain of Australian Large Red. Satisfactory in most parts of the State
Bone's Large Red	Chinese	Large, flat, crinkled	Good	Bright-red	2nd early	Medium to tall	In the bush form without pruning	Selected strain of Australian Large Red. Not quite as smooth and round as Bendigo Large Red
Break O'Day	Globe or canning	Large, smooth, round	Shy	Red	1st early	Medium	Staking and pruning optional. Bush form in northern districts	Resistant to fusarium wilt. Fruit of nice quality
Bonny Best	Globe or canning	Medium, round, slightly flat	Medium	Pale-red	2nd early	Medium	Staking and pruning optional. Bush form in northern districts	Somewhat similar to Chalk's Early Jewel. Does better in Victoria when grown as a late variety; softens badly if grown too early. Speaking generally it is not satisfactory in Victoria
Beefsteak Syn. Crimson Cushion	Globe or canning	Large, round, flat	Shy	Bright-red	Midseason and late	Medium	Staking and pruning optional	Does well with some growers, but in most instances is subject to "catfaces"
Burwood Wonder	Chinese	Large, flat, crinkled	Good	Bright-red	1st early	Dwarf	In the bush form without pruning. Stake and prune only for home gardens	Almost identical with South Australian Dwarf. Is the main crop variety in the Goulburn Valley. Suitable for unheated glass-house culture

A DESCRIPTIVE LIST OF MOST OF THE TOMATO VARIETIES THAT HAVE BEEN GROWN IN VICTORIA—*continued*.

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Burwood Prize	Globe or canning	Large, smooth, round	Medium	Red	2nd early	Tall	Staking and pruning optional in the field. Stake and prune in home garden	Potato leaf. Stylar spot is rather excessive and this detracts from its market value. Is quite suitable, however, as a home garden variety
Burbank	Globe or canning	Large, smooth, round, slightly flat	Shy to medium	Bright-red	1st early	Medium	Staking and pruning optional	Somewhat like Earlianer. Splits and softens badly. Useful as a home garden variety
Bowen Buckeye....	Globe (but not canning)	Medium, smooth, round	Good	Pink	Midseason or main crop	Tall	Bush form; unpruned	Excellent variety developed by Queensland Department of Agriculture. Most of the tomatoes shipped to Melbourne from Bowen in recent years have been of this variety. It does well in Victoria, especially the Bendigo areas. Unfortunately the pink coloured tomatoes are not popular in the trade
Buckeye State Syn. Targinnie	Globe (but not canning)	Large, smooth, round	Medium	Purplish-red	Midseason and late	Tall	Bush form; unpruned	Splits badly in most Victorian districts, but quite a good home garden variety
Burpee's Dwarf Giant	Globe (but not canning)	Very large round, slightly ribbed	Medium	Purplish-crimson	Midseason and late	Dwarf	Bush form; unpruned. Lightly pruned on stakes in the home garden	Somewhat of the Ponderosa type. Excellent quality. Its colour confines it to the home garden
Belle de Massy	Dessert or cluster	Small, round flat, ribbed	Good	Red	2nd early	Tall	Single leader on stakes	Is now superseded by a number of superior varieties
Brittain's Best	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Tall ...	Single leader on stakes	Useful variety in its class. Grown in glass-houses near Mount Gambier, and as a main crop staking variety by a few growers in Portland. Should be manured heavily, and the clusters of fruit thinned or shortened as soon as they have set
Chalk's Early Jewel	Globe or canning	Medium, smooth, round, slightly flat	Medium	Bright-red	1st early	Medium	Staking and pruning is optional, but recommended in home garden	The fruit softens badly in most districts. Both Chalk's Early Jewel and Bonny Best do well in Bacchus Marsh and Bairnsdale districts. Excellent home garden variety in its season
Colossal	Globe (but not canning)	Very large, smooth, round	Medium	Dark-pink	Midseason and late	Medium	Unpruned and in the bush form. Staked and lightly pruned in home garden	A good tomato, but on account of its pink colour falls into the home garden class
Columbia	Globe or canning	Medium, smooth, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	Good canning quality, but not recommended on account of its shy cropping habit
City of Paramatta	Dessert or cluster	....	....	....	....	....	Single leader on stakes	A selected strain of "Best of All." New variety being tested
Carter's Early Sunrise	Desert or cluster	Small, smooth, round	Good	Red	2nd early	Tall	Single leader on stakes	Manure heavily and thin or shorten the clusters as soon as the fruit has set
Crimson Cushion Syn. Beefsteak	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Midseason and late	Medium	Staking and pruning optional	Subject to "catface"
Crimson Bell	Globe or canning	Large, smooth, round, slightly flat	Medium to good	Bright-red	2nd early and main crop	Medium	Unpruned and in the bush form	Excellent variety for Bacchus Marsh and Bairnsdale districts

A DESCRIPTIVE LIST OF MOST OF THE TOMATO VARIETIES THAT HAVE BEEN GROWN IN VICTORIA—*continued.*

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Coronation	Globe or canning	Medium, smooth, round, flat	Medium	Bright-red	2nd early	Tall	Unpruned and in the bush form	Inclined to "throw back" to the Chinese type from which it originated
Canner 114	Chinese	Large, flat, slightly crinkled	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	A tomato of good quality, received from Illinois, United States of America. Very shy in various tests
Coreless	Globe or canning	Large, smooth, round	Shy	Bright-red	Midseason and late	Medium	Staking and pruning optional	Good quality tomato, but prone to splitting. Home garden variety
Cherry (Red)	Ornamental cluster	Very small, smooth, round, about ½ inch in diameter	Good	Bright-red	....	....	Unpruned and in the bush form	Useful to serve at cocktail parties, especially if mixed with yellow variety. About ½ inch of stalk should be retained on the fruit if marketing for this purpose
Cherry (Yellow)....	Ornamental cluster	Very small, smooth, round, about ½ inch in diameter	Good	Yellow	....	....	Unpruned and in the bush form	Remarks for the Red Cherry also apply. Both varieties are very resistant to disease
Currie	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Tall	Single leader on stakes	Useful variety in its class, but now superseded by better types. Very resistant to leaf mould
Dividend	Globe or canning	Large, smooth, round, flat	Medium	Red	2nd early	Dwarf to medium	Unpruned and in the bush form	Ripens unevenly. A navel frequently forms at the stylar end. Is a selection from one of the Chinese types, and should be grown as such
Denisonia	Globe or canning	Large, smooth, round	Shy	Red	Midseason to late	Tall	Unpruned and in the bush form	Excellent variety, produced by the Queensland Department of Agriculture, but is unsatisfactory under our conditions
Dwarf Perfection	Globe or canning	Large	Medium	Bright-red	Midseason	Dwarf to medium	Staking and pruning optional	
Earlianer	....	....	....	....	....	....	....	See Australian Earlianer and Sunnybrook Earlianer
Eccles Surprise	Globe (but not canning)	Large, smooth, round, slightly flat	Medium to good	Dull, pale-red	Late	Tall	Four or five leaders on stakes	Excellent late variety for local market. Do not plant early (after middle of October)
Excelsior	Dessert or cluster	Small, smooth, round	Good	Red	2nd early	Tall	Single leader on stakes	Manure heavily, and thin or shorten the clusters as soon as the fruit has set. Inclined to run small
Earliwinner	Globe or canning	Medium, smooth, round	Medium cropper	Red	1st early	Tall	Staking and pruning optional. Bush form in northern districts	Somewhat similar to Earlianer. Gives better results as a late variety
Early Baltimore	Globe or canning	Large, smooth, round, flat	Shy	Red	2nd early	Tall	Unpruned and in the bush form	Very subject to "catface"
Early Pride Syn. June Pink	Globe (but not canning)	Large, smooth, round, flat	Medium	Purplish-pink	1st early	Tall	Unpruned and in the bush form	Somewhat similar to Earlianer, but pink
Early Shipper	Globe or canning	Large, smooth, round, slightly flat	Shy	Red	1st early	Medium	Unpruned and in the bush form	Very subject to "catface"
Frogmore	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Tall	Single leader on stakes	Manure heavily, and thin or shorten the clusters as soon as the fruit sets

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Golden Queen	Chinese	Large, more or less corrugated, slightly flat	Shy to medium	Yellow	Midseason and late	Medium	Unpruned and in the bush form	Many fruits are slightly suffused with pink at the stylar end. A home garden variety with very mild flavour
Globe	Globe (but not canning)	Medium, smooth, round	Shy to medium	Purplish-pink	Midseason and late	Medium	Single leader on stakes	A home garden variety
Guernsey Gem	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Medium	Single leader on stakes	Grown in Portland district. Manure heavily, and thin or shorten the clusters as soon as the fruit sets
Grendon Prolific	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Medium	Single leader on stakes	
Greater Baltimore	Globe or canning	Large, smooth, flat	Shy	Bright-red	Midseason and late	Tall	Unpruned and in the bush form	Good canning quality, but too shy and subject to "catface"
Heinz Special	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	Subject to "catface." Not recommended
Heterosis	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	Midseason	Tall	Single leader on stakes	Excellent home garden variety
Harbinger	Globe or canning	Large, round, slightly flat, sometimes corrugated	Medium	Bright-red	1st early	Medium	Unpruned and in the bush form	Home garden variety
Hawken's Large Red	Chinese	Large, flat, crinkled	Good	Bright-red	2nd early and main crop	Tall	Unpruned and in the bush form	A strain of Australian Large Red
Harlesden	Globe or canning	Large, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	Subject to "catface" and large stylar end scar. Not recommended
Helvetia	Dessert or cluster	Small, smooth, round	Good	Red	2nd early to midseason	Tall	Single leader on stakes	Manure heavily, and shorten the clusters as soon as the fruit sets
Intermediate	Chinese	Large, flat, crinkled	Good	Bright-red	Main crop	Tall	Staking and pruning optional	Somewhat similar to Burwood Wonder or South Australian Dwarf, but not dwarf in habit. Largely grown in New South Wales in unheated glass-houses
Illinois Pride	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Midseason and late	Tall	Unpruned and in the bush form	Subject to "catface." Stylar end scar too large
Illinois Baltimore	Globe or canning	Large, smooth, round flat	Shy	Bright-red	Midseason and late	Tall	Unpruned and in the bush form	Subject to "catface." Stylar end scar too large
Improved Stone	....	....	....	....	....	....	....	Syn. Norton
John Baer	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	1st early	Medium	Unpruned and in the bush form	Slightly subject to "catface"
John Baer (Bones)	Globe or canning	Medium, smooth, round, flat	Medium	Bright-red	1st early	Medium	Unpruned and in the bush form. About three leaders on stakes for home garden	A selected strain of John Baer. A good early variety. Somewhat similar to Bonny Best
June Pink	....	....	....	....	1st early	....	....	Syn. with Early Pride
Kondine Red	Dessert or cluster	Small, smooth, round	Good	Bright-red	2nd early	Tall	Single leader on stakes	A useful variety of its type. Manure heavily: shorten or thin the clusters as soon as the fruit has set. Suitable for heated glass-houses

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Keystone Syn. with Penn State	Globe or canning	Large, smooth, round, slightly flat	Shy to medium	Bright-red	1st early	Medium	Unpruned and in the bush form	A useful variety, but shy cropper in our tests. One of the few varieties with determinate habit of growth. (See fruiting habits of tomatoes in section Planting out—Staking, p. 165, April Journal)
King Humbert	Dessert or cluster	Size and shape of a pullet's egg	Good	Bright-red	Late	Tall	Single leader on stakes	Very resistant to disease. Home garden variety
Low Branch	Globe or canning	Large, smooth, round	Medium	Bright-red	Midseason and late	Dwarf	Staking and pruning optional	An excellent variety. More of this class of tomato should be grown in Victoria
Marhio Syn. with Marvellous	Globe or canning	Medium, smooth, round	Medium	Pink	2nd early	Tall	Unpruned and in the bush form. Very lightly pruned if on stakes	Very similar to Marglobe only pink. Resistant to fusarium wilt
Marvellous	....	....	....	....	....	....	....	Syn. with Marhio
Mac's Special	Chinese	Large, flat, crinkled	Good	Bright-red	2nd early	Medium	Unpruned and in the bush form	An excellent strain of the Australian Large Red
Marglobe	Globe or canning	Medium, smooth, round, slightly oval	Medium	Pale-red	2nd early	Medium	Staking and pruning optional	Resistant to fusarium wilt. Now superseded by Red Marhio
Market King	Dessert or cluster	Small, smooth, round	Good	Bright-red	2nd early	Tall	Single leader on stakes	Manure heavily, and shorten or thin the clusters as soon as the fruit sets. A useful variety of its type
Matchless	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	A selected strain of the "Stone" variety
Marvana	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	1st early	Medium	Unpruned and in the bush form	Resistant to fusarium wilt
Mikado	Globe or canning	Large, round, slightly corrugated, and slightly flat	Shy	Purplish-pink	2nd early	Medium	Unpruned and in the bush form	A potato leaf variety
Money Maker	Dessert or cluster	Small, smooth, round	Good	Bright-red	2nd early	Medium	Single leader on stakes	
Mortgage Lifter....	Chinese	Large, flat, crinkled	Good	Bright-red	Midseason	Medium	Unpruned and in the bush form	A selected strain of Australian Large Red
Midseason Shipper	Globe or canning	Large, smooth, round	Medium	Bright-red	Midseason and late	Tall	Unpruned and in the bush form	A new variety from United States of America. Tested 1937 and 1938 seasons
Maori Chief	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Tall	Single leader on stakes	Is now superseded by better cluster types
Marvel	Globe or canning	Large, round, slightly flat	Medium	Red	Midseason	Medium	Staking and pruning optional	A shy cropper. Very resistant to disease
Norton	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	Subject to "catface." Resistant to fusarium wilt. A strain of the "Stone" variety
Norduke	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	A cross between Norton and Duke of York. Resistant to fusarium wilt. Not recommended on account of shy cropping habit
Orange Prolific	Chinese	Large, flat, slightly ribbed	Good	Bright-red	Late	Tall	Unpruned and in the bush form	A well known main crop variety in southern Victoria. Very resistant to disease

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Paragon	Globe or canning	Large, smooth, round	Medium	Bright-red	Midseason	Tall	Unpruned and in the bush form	According to records this was the first smooth round red tomato. It was produced by Livingstone in 1870; nearly 70 years ago
Paris	Chinese	Large, flat, crinkled	Good	Bright-red	Midseason	Tall	Unpruned and in the bush form	Possibly the first of the Chinese types to be grown in Victoria. Introduced about 1860 to 1865; nearly 80 years ago
Ponderosa	Globe (but not canning)	Very large, round, slightly flat and ribbed	Medium	Purple	Late	Tall	Single leader on stakes	A home garden variety of good quality and enormous size
Peach	Ornamental	Small, smooth, round	Good	Yellow	Midseason	Dwarf	Staking and pruning optional	Home garden purposes. Has a bloom something like a peach
Peach	Ornamental	Small, smooth, round	Good	Pink or red	Midseason	Dwarf	Staking and pruning optional	The fruit has a bloom something like a peach
Pear	Ornamental	Small, pear-shaped	Good	Yellow	Midseason	Dwarf	Staking and pruning optional	Home garden purposes
Pear	Ornamental	Small, pear-shaped	Good	Red	Midseason	Dwarf	Staking and pruning optional	Home garden purposes
Plum	Ornamental	Small, smooth, round	Good	Yellow	Midseason	Dwarf	Staking and pruning optional	Home garden purposes. These ornamental varieties are very resistant to disease
Penn State	....	....	....	....	....	....	....	Syn. with Keystone. One of the few varieties with a determinate habit of growth. See explanation in chapter on Planting Out and Staking
Pritchard	Globe or canning	Medium, smooth, round	Medium to good	Bright-red	2nd early	Medium	Single leader on stakes	Fairly resistant to fusarium wilt. Not recommended for thin, weak, or sandy soils. Sometimes runs small. Syn. with Scarlet Topper
Potentate	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	1st early	Tall	Single leader on stakes	One of the largest and best of the cluster types in our tests. Manure heavily and shorten or thin the clusters as soon as the fruit sets
Principe Borghesi	Dessert or cluster	Size and shape of a pullet's egg	Good	Bright-red	2nd early	Tall	Single leader on stakes	An excellent sauce and chutney variety, but unfortunately does not ripen evenly
Potato Leaf	Globe (but not canning)	Medium, smooth, round	Shy to medium	Purplish-red	Midseason	Tall	Single leader on stakes	Now superseded by better varieties
Prosperity	Dessert or cluster	....	....	....	....	....	Single leader on stakes	A new variety being tested
Prairiana	Globe or canning	Large, smooth, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	A variety produced to suit the prairie soils of United States of America. Unsuitable in Victoria
Pale Leaf	Chinese	Large, flat, crinkled	Good	Bright-red	Main crop	Medium	Unpruned and in the bush form	A well-known main crop variety in northern Victoria. Popular with Chinese market gardeners. Syn. with Yellow Top
Planter's Favourite	Dessert or cluster	Small, smooth, round, slightly flat	Good	Red	2nd early	Tall	Single leader on stakes	Useful variety in its class. Manure heavily, and shorten the clusters as soon as the fruit sets
Recruit (Bide's)....	Dessert or cluster	Small, smooth, round, slightly flat	Good	Bright-red	2nd early	Tall	Single leader on stakes	Inclined to run too small. Walker's Recruit is recommended

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Recruit (Walker's)	Dessert or cluster	Small, smooth, round, slightly flat	Good	Bright-red	2nd early	Tall	Single leader on stakes	A selected strain of Recruit. Larger than Bide's Recruit. Manure heavily, and shorten the clusters as soon as the fruit sets
Red Currant	Ornamental	Size and shape of a pea	Good	Bright-red	Midseason	Medium	Unpruned in and the bush form	Of little value commercially. Suitable for home gardens
Rouge de Marmande	Chinese	Large, round, flat, crinkled	....	Bright-red	1st early	....	Unpruned and in the bush form	A new variety now being tested
Red Colossal	Globe or canning	Very large, smooth, round	....	....	....	....	....	A new variety now being tested. Probably a selected strain of Colossal
Red Marhio	Globe or canning	Medium, smooth, round	Medium	Bright-red	2nd early	Medium	Staking and pruning optional	A variety of outstanding merit in its class. Recommended. Resistant to fusarium wilt
Rutgers	Globe or canning	Large, round, flat	Medium	Bright-red	Midseason and late	Medium	Unpruned and in the bush form	A comparatively new variety. Did not give such good results in our tests as Red Marhio. Resistant to fusarium wilt
Radio	Dessert or cluster	Small, smooth, round, slightly flat	Good	Bright-red	2nd early	Medium	Single leader on stakes	A useful variety in its class. Manure heavily, and shorten the clusters as soon as the fruit sets
Scarlet Dawn	Globe or canning	Large, smooth, round, flat	Medium	Bright-red	2nd early	Tall	Staking and pruning optional	A variety from United States of America that gave good results in our trials
Scarlet Topper	....	....	....	....	....	....	....	Syn. with Pritchard
Sensation (Portland)	Dessert or cluster	Large, smooth, round, slightly flat	Good	Bright-red	2nd early	Tall	One or two leaders on stakes	A variety of outstanding merit in its class. Largest of the cluster varieties grown in Victoria. Grown extensively in Portland and other districts. Manure heavily, and shorten the clusters very lightly as soon as the fruit sets
Sensation (Woodwood's)	Dessert or cluster	Large, smooth, round, slightly flat	Good	Bright-red	2nd early	Tall	Single leader on stakes	A different variety from Portland's Sensation. Smaller.
San Marzano	Capsicum-shaped cluster	Like a large Chili	Good	Bright-red	2nd early, but does better as midseason and late	Medium	Whole bush tied up on stakes. Not pruned	An exceptionally good sauce variety. Somewhat dry and mealy. Recommended. Unlike other varieties should not be harvested until fully red ripe
Somner's Filbasket	Dessert or cluster	Small, smooth, round	Good	Bright-red	2nd early	Tall	Single leader on stakes	Manure heavily. Shorten the clusters as soon as the fruit sets
Somner's Long Keeper	Chinese	Large, round, flat, crinkled	Good	Bright-red	2nd early	Medium	Unpruned and in the bush form	Main crop variety in some of the cooler coastal districts. Crops well in all parts of the State
Stone	Globe or canning	Large, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	Good quality, but very subject to "catface." Not recommended
Sutton's Best of All	Dessert or cluster	Small, smooth, round, slightly flat	Good	Bright-red	2nd early	Tall	Single leader on stakes	Manure heavily. Shorten the clusters as soon as the fruit sets. Now superseded by better varieties
Sutton's Success	Dessert or cluster	Small, smooth, round, slightly flat	Good	Bright-red	2nd early	Tall	Single leader on stakes	Manure heavily. Shorten the clusters as soon as the fruit sets. Now superseded by better varieties

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South Australian Dwarf	Chinese	Large, round, flat, crinkled	Good	Bright-red	1st early	Dwarf	Unpruned and in the bush form, except in home gardens and glass-houses	Main crop variety in many parts of the State. Particularly suitable for Goulburn Valley and northern irrigation districts
Smith's Perfection	Chinese	Large, round, flat, crinkled	....	Bright-red	Main crop	....	Unpruned and in the bush form	Requires further testing
Sunnybrook Earlianer	Globe or canning	Large, smooth, round, flat	Medium	Pale-red	1st early	Tall	Staking and pruning optional. Unpruned in the bush form in northern districts	A selected strain of Earlianer. Recommended in preference to the other types
Salad's Special	Dessert or cluster	....	....	....	....	....	Single leader on stakes	New variety from New South Wales now being tested
Spark's Earlianer	....	....	....	....	....	....	....	Syn. with Earlianer
Table Dainty	Dessert or cluster	Small, smooth, round, slightly flat	Good	Bright-red	2nd early	Medium	Single leader on stakes	A selected strain of one of the English cluster varieties. Tends to run too small
Targinnie Blue	....	....	....	....	....	....	....	Syn. with Buckeye State
Trophy	Globe or canning	Medium, smooth, round, slightly corrugated	Medium	Bright-red	Late	Tall	Staking and pruning optional	Now superseded by better varieties
Tree Tomato	Ornamental tree	Size and shape of a pullet's egg	Medium	Bright-red	Midseason and late	Very tall	Unpruned and in the form of a tree or shrub	This is really not a tomato, but a sub-tropical shrub (*Cyphomandra*). The fruit resembles the tomato in appearance only; hence the name "tree tomato"
Trucker's Favourite	Globe (but not canning)	Large, smooth, round	Medium	Purplish-red	Late	Tall	Unpruned and in the bush form	A good tomato, but not favoured on account of its colour
Velocity	Chinese	Large, round, flat, crinkled	Good	Bright-red	1st early	Dwarf	Staking and pruning optional. Usually unpruned and in the bush form	A variety very hard to distinguish from Wilding, Burwood Wonder, and South Australian Dwarf
Wilding's Prolific	Chinese	Large, round, flat, crinkled	Good	Bright-red	1st early	Dwarf	Staking and pruning optional. Usually unpruned and in the bush form	Very similar to Velocity, Burwood Wonder, and South Australian Dwarf
Wallent's Prolific	Dessert or cluster	Small, round, slightly flat	Good	Bright-red	2nd early	Tall	Single leader on stakes	Now superseded by other cluster varieties
Walker's Recruit	....	....	....	....	....	....	....	See Recruit
Yellow Top	....	....	....	....	....	....	....	Syn. with Pale Leaf
57 Wonder	Globe or canning	Large, round, flat	Shy	Bright-red	Late	Tall	Unpruned and in the bush form	Very subject to "catface." Not recommended

Standard Herd Records

For Quarter ended 31st December, 1939

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 198, of which 148 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year old (between 4 and 4½ years at time of calving) ..	310 lb. butter-fat.
Senior 4-year old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

(Except where otherwise stated, the period of test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Alston, N. B. and Sons, Romsey, Jersey (5).										
Craig Mohr Rose Petal ..	56948	2.3.39	22½	6,561	5·70	373·76	310	Jr. 4	167, 234 ..	Rosyth Jessie's Laird
Rosyth Gay Brownie ..	59332	27.12.38	21½	5,676	5·53	313·79	290	Sr. 3	192, 295 ..	Werribee Gay Piece
Rosyth Gay Princess ..	55121	5.3.39	31	7,299	5·41	394·74	350	Mature	325, 295, 320	Werribee Gay Piece
Rosyth Gay Rosebud ..	64112	23.1.39	25½	6,423	5·30	340·14	270	Jr. 3	237 ..	Werribee Gay Piece
Rosyth Tulip 2nd ..	59338	3.1.39	20½	5,946	5·03	299·00	310	Jr. 4	239, 251 ..	Werribee Gay Piece
Atkinson, W. K., Swan Hill, Dairy Shorthorn (9).										
Willow Park Butterfly 9th	519D	14.1.39	20½	7,532	4·43	333·69	270	Jr. 3	.. ..	Wicklesham Lord Barrington 5th (Imp.
Willow Park Countess 13th	1248E	10.1.39	17½	8,342	4·14	345·18	350	Mature	323, 389 ..	Willow Park Lustre 3rd
Willow Park Duchess 34th	Vol. 2	11.2.39	19	5,619	3·31	185·99	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 35th	Vol. 2	13.3.39	22	7,305	3·60	262·87	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 28th ..	Vol. 2	30.12.38	22	8,349	3·46	289·13	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Melba 31st ..	Vol. 2	5.12.38	20½	6,750	3·87	261·04	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Moss Rose 13th	559D	20.3.39	10	5,925	3·52	208·76	270	Jr. 3	243 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Moss Rose 14th	Vol. 2	13.2.39	25½	8,629	3·28	282·68	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Ruby 8th ..	Vol. 2	27.2.39	20	6,593	3·87	255·22	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Ballarat Orphanage, Ballarat, Jersey (5).										
Blackwood Grove Miss Leach	37935	23.3.39	26	7,584	4·87	368·97	350	Mature	405, 388 ..	Burnside Harmony
Orphanage Clara 2nd ..	54575	15.2.39	22	6,299	5·63	354·74	350	Mature	325, 397 ..	Jerseylea Quality Boy
Orphanage Doris 5th ..	Vol. 26	15.1.39	14	5,175	5·48	283·49	250	Sr. 2	255 ..	Jerseylea Quality Boy
Orphanage Handsome 2nd	63534	28.12.38	15½	7,058	5·45	384·59	350	Mature	316 ..	Orphanage Pride
Orphanage Maud ..	41404	26.1.39	29	8,124	5·52	448·08	350	Mature	315, 420, 373	Orphanage Quicksand Prince
Butcher, F. T., Murraydale, Red Poll (1).										
Maryville Esther ..	4740A	25.2.39	10	5,270	4·50	236·89	310	Jr. 4	261 ..	Chandpara Ferdinand
Calf, A. J., Werribee South, Jersey (3).										
Clydevale Carrilla ..	33266	11.2.39	22	7,735	5·68	438·97	350	Mature	426, 423, 468, 442	Staghorn Master's Defiance
Illillouette Mary	Vol. 26	19.3.39	15½	4,649	6·28	292·03	230	Jr. 2	.. ..	Finchley Master's Boy
Illillouette Master's Tangerine	Vol. 26	14.3.39	15½	5,235	6·72	352·03	270	Jr. 3	.. ..	Finchley Master's Boy
Chadderton, J. E., Hamilton, Jersey (2).										
Glen Leigh Daphne 2nd ..	61705	19.2.39	24½	6,597	5·61	370·26	230	Jr. 2	.. ..	Selsey Jupiter
Glen Leigh Dawn 3rd ..	57357	26.2.39	20	5,433	6·30	342·29	250	Sr. 2	.. ..	Selsey Jupiter
Chirnside, R. M., Whittlesea, Jersey (2).										
Bellefaire Belle Finesse ..	26738	4.2.39	36	10,517	5·05	530·80	350	Mature	.. ..	Werribee Prince Twylish
Werribee Mimi	33118	18.3.39	34½	11,698	5·50	643·74	350	Mature	598, 647 ..	Werribee Grandmaster
Clarke, F. W., Toora, Jersey (2).										
Hazelgrange Mistress ..	40188	27.12.38	23	9,320	5·31	494·86	350	Mature	356, 465, 490, 673, 599	Master Clement of Glen Iris
Mer Vue Sister	58406	9.2.39	35	11,463	5·77	661·56	310	Jr. 4	469, 629 ..	Woorayl Flashlight

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Cobain, J., Maffra, Jersey (2).										
Clarendon Eyre Dorothy 5th	61087	29.1.39	22	6,531	4·73	308·82	230	Jr. 2	.. ..	Rochette's Golden (Imp.)
Idalia Tangerine	57742	2.2.39	20½	5,627	5·09	286·56	270	Jr. 3	.. ..	Clarendon Eyre Oxford's Dreamer
Colenso, L. W. R., Alvie, Jersey (2).										
Normandie Hawthorn 3rd	41296	7 3.39	30	6,669	5·08	338·87	350	Mature	284, 327, 351, 331	Peer of Lewisham
Normandie Ilma 6th ..	Vol. 26	8.3.39	22½	5,949	6·01	357·55	230	Jr. 2	.. ..	Normandie Majestic
Coulthard, J. L. and Son, Whittlesea, Jersey (1).										
Elmwood Merry Lark ..	57189	6.2.39	24	7,531	5·38	405·15	350	Mature	363, 416, 335	Austral Valley Lord Larkspur
Daley, Mrs. G. S., Echlin South, Jersey (6).										
Clarendon Eyre Cinderella	52253	28.1.39	9½	4,143	5·85	242·35	350	Mature	331, 450 ..	Clarendon Eyre Eminent's Achievement
Clarendon Eyre Primrose 2nd	47632	15.2.39	19½	6,551	5·40	353·58	350	Mature	368, 390 ..	Victorious Pioneer (Imp.)
Clarendon Eyre Tangerine 9th	56813	6.3.39	30	7,967	5·60	445·90	350	Mature	375 ..	Victorious Pioneer (Imp.)
Glen Iris Golden Dream ..	57356	21.1.39	10½	5,281	5·73	302·55	270	Jr. 3	278 ..	Design's Golden Oxford (Imp.)
Karrara Twylish Tangerine	Vol. 26	27.3.39	14½	4,065	5·32	216·41	230	Jr. 2	.. ..	Sylvandale Twylish Laddie
Springhurst Coronation Yarran	46186	27.3.39	17½	5,363	6·01	323·73	350	Mature	294, 372 ..	Design's Ruler (Imp.)
Department of Agriculture, Werribee, Friesian (6).										
Victoria Ballerina ..	Vol. 14	9.1.39	29½	8,962	3·87	346·81	330	Sr. 4	288, 372 ..	Victoria Joyous Mercedes
Victoria Choree	5105	16.1.39	35	10,772	3·69	397·42	350	Mature	263, 357, 401	Victoria Double Top
Victoria Domino ..	5107	7.2.39	35½	11,507	4·14	475·85	350	Mature	362, 347, 469	Victoria Joyous Mercedes
Victoria Domino Josie ..	Vol. 14	18.1.39	30½	9,525	3·46	329·97	230	Jr. 2	.. ..	Rupertswood Inka Jo
Victoria Double Plebe ..	Vol. 14	23.1.39	N.o.c.	15,174	3.24	491·98	350	Mature	369, 493 ..	Victoria Double Top
Victoria Woodcrest Daisy	5112	23.3.39	25½	15,164	3·53	535·54	350	Mature	307, 389, 425, 416	Victoria Joyous Mercedes
Department of Agriculture, Werribee, Red Poll (13).										
Victoria Amabel	Vol. 10	14.2.39	23½	6,641	4·32	286·97	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Chest	Vol. 10	27.3.39	15½	5,873	4·29	252·18	250	Sr. 2	.. ..	Chandpara Valentine
Victoria Heroine ..	6019A	10.2.39	20	6,405	5·22	334·47	290	Sr. 3	379 ..	Woodburn Peter Pan
Victoria Marsupalia ..	3916A	6.1.39	33½	10,581	4·40	465·81	350	Mature	290, 429 ..	Dominion Bright Belgian
Victoria May Queen ..	3514AA	31.1.39	22	7,292	3·68	268·02	350	Mature	271, 298, 366, 376	Victoria Royal Ringer
*Victoria Mount Etna ..	Vol. 10	4.2.39	4	5,985	4·42	264·41	270	Jr. 3	264 ..	Chandpara Valentine
Victoria Nectarine ..	3917A	27.12.38	22½	8,003	4·02	321·40	350	Mature	254, 280, 325, 347	Victoria Royal Ringer
Victoria Pepita	6027A	13.3.39	21	8,808	4·62	406·49	330	Sr. 4	370 ..	Woodburn Peter Pan
Victoria Red Tape ..	Vol. 10	16.3.39	N.o.c.	5,637	5·20	292·86	270	Jr. 3	256 ..	Woodburn Peter Pan
†Victoria Southern Cross ..	Vol. 10	8.3.39	..	4,965	4·22	209·54	230	Jr. 2	.. ..	Victoria Gallant
†Victoria Venetia ..	4895A	18.3.39	..	6,090	4·56	277·83	350	Mature	254, 306, 359	Victoria John Bull
Victoria Wendy	6034A	20.3.39	10½	6,966	4 53	315·75	290	Sr. 3	369 ..	Woodburn Peter Pan
Victoria Wildwood ..	6036A	20.1.39	5½	7,442	4·26	317·12	310	Jr. 4	353 ..	Woodburn Peter Pan
Dookie Agricultural College, Dookie, Ayrshire (4).										
Dookie Lila	30382	13.3.39	16½	7,910	4·17	329·90	310	Jr. 4	324 ..	Tregorland Indispensible
Dookie Peony	30383	7.3.39	23	12,441	4·62	574·83	310	Jr. 4	379 ..	Longerenong Baron
Dookie Sappho	23672	16.3.39	20½	13,607	4·89	665·58	350	Mature	451, 423, 545, 564, 584, 746	Dookie Beau
Dookie Sunshine ..	30385	8.2.39	18½	6,852	4·38	299·89	290	Sr. 3	228 ..	Tregorland Indispensible
Enders, N. H., Stanhope, Jersey (1).										
The Wattle's Moleen 4th ..	Vol. 26	3.3.39	19½	6,779	5·23	354·82	230	Jr. 2	.. ..	The Wattle's Silver Gamboge
Fadersen, J. H., Mandurang, Jersey (1).										
Grovelea Fancy Morocco ..	57605	6.1.39	25	7,207	5·58	402·44	310	Jr. 4	.. ..	Mornmoot Monarch 2nd
Fairchild and Clutterbuck, Tinamba, Jersey (3).										
Rowallan Silvermine 4th ..	64128	19.3.39	22½	7,962	5·03	400·29	230	Jr. 2	.. ..	Banyule Comet
Vaucluse Daphne 2nd ..	Vol. 26	4.2.39	13½	5,648	5·78	326·30	230	Jr. 2	.. ..	Glen Iris Violin
Vaucluse Duchess 2nd ..	C.R.	16.2.39	24½	6,986	5·75	401·36	250	Sr. 2	.. ..	Paisley Master
Fixter, A., Boisdale, Guernsey (1).										
Avonview Jean	6729	17.1.39	16½	5,765	6·08	350·50	230	Jr. 2	.. ..	Kentdale Monogram
Foster, A. O., Boisdale, Jersey (7).										
Boisdale Fuchsia ..	43051	3.1.39	7½	2,568	6·11	156·89	350	Mature	353, 230, 282	Gladiator of Springhurst
Boisdale Fuchsia 3rd ..	Vol. 26	10.1.39	13	3,344	5·12	171·14	230	Jr. 2	.. ..	Boisdale Lord
Boisdale Hazel 2nd ..	Vol. 26	7.3.39	15	3,886	5·73	222·62	250	Sr. 2	.. ..	Wompini Master Grey
‡Boisdale Marjorie ..	47293	15.3.39	N.o.c.	3,569	5 37	191·50	350	Mature	181, 249, 205	Boisdale Gladlip
Boisdale Natty 2nd ..	47295	15.1.39	21	4,103	5·84	239·60	330	Sr. 4	205, 283 ..	Boisdale Dazzler
Boisdale Twilight ..	47297	31.12.38	9	4,304	5·70	245·46	350	Mature	236, 226, 208	Boisdale Dazzler
Studleigh Harebell 21st ..	59548	10.1.39	6½	3,315	6·24	206·78	350	Mature	251, 246 ..	Studleigh Harebell's Napoleon

* 250 days in test. † 240 days in test (sold). ‡ 252 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Fraser, G. A., Addington, Ayrshire (4).										
Bonnie Doon Heatherbell	28138	4.3.39	24½	10,184	5·56	566·49	310	Jr. 4	351, 556 ..	Glengowrie Masterpiece
Bonnie Doon Honey ..	26972	7.3.39	27	11,916	5·30	631·23	350	Mature	378, 597 ..	Glengowrie Masterpiece
Bonnie Doon Lena ..	29147	7.3.39	13	7,134	4·09	291·74	290	Sr. 3	324 ..	Bonnie Doon Baronet
Bonnie Doon Snowdrop ..	23467	3.3.39	30½	10,547	4·66	491·21	350	Mature	381, 356, 555, 551	Blair Athol Dream Boy
Gay, R. G. and Son, North Devon, Jersey (2).										
Elm Grove Jessie Fowler 3rd	43736	14.2.39	38	10,091	5·07	512·01	350	Mature	289, 401, 497	Warenda Ragtime Dominant
Elm Grove Veronique ..	57177	9.3.39	23½	6,727	6·18	415·78	330	Sr. 4	223, 323 ..	Elm Grove Starlight
Grice, C. S., Somerville, Jersey (1).										
Banyule Silvermine 99th ..	51658	13.3.39	22	7,016	5·06	417·94	290	Sr. 3	331 ..	Banyule Triplane
Handley, S. C., Dandenong, Jersey (1).										
Barrowby Briar Rose ..	60508	12.1.39	31	8,976	4·72	424·06	250	Sr. 2	303 ..	Barrowby Sonny
Harvey, T., Boisdale, Jersey (7).										
Jerseyholm Bluebell 18th	44479	22.2.39	22½	7,757	5·75	445·74	350	Mature	371, 433, 367	Werribee Master Fox
Jerseyholm Bluebell 36th	62307	1.1.39	15½	4,830	4·69	226·62	230	Jr. 2 ..	..	Banyule Biplane
Jerseyholm Empress 51st	57849	16.1.39	7½	4,599	5·58	256·57	270	Jr. 3 ..	..	Jerseyholm Master Fox 6th
Jerseyholm Empress 53rd	57850	11.3.39	19	5,470	5·30	289·74	250	Sr. 2	217 ..	Jerseyholm Master Fox 6th
Jerseyholm Empress 55th	62312	27.3.39	25	7,379	4·68	345·63	250	Sr. 2	.. ..	Mornmoot Mars
Jerseyholm Lady Marge 11th	37513	17.1.39	26½	6,735	5·37	361·61	350	Mature	277, 379, 440, 455, 394	Lord Island Fancy of Brucevale
Jerseyholm Lady Marge 14th	53367	5.1.39	16½	5,600	5·76	322·66	350	Mature	273, 249, 366	Werribee Master Fox
Haywood, Dr. A. R., Hastings, Jersey (4).										
Somerville Couer-de-Rose 4th	Vol. 26	9.1.39	15½	3,605	6·20	223·44	230	Jr. 2 ..	.. ..	Somerville Chief Ruler
Windrest Chevy's Cherub	64936	30.1.39	18½	6,183	5·75	355·44	270	Jr. 3	386 ..	Glen Iris Matador
Windrest Gay Marie ..	Vol. 26	2.2.39	24	6,211	4·68	290·64	230	Jr. 2 ..	.. ..	Gadget (Imp.)
Windrest Rose Marie 3rd	C.R.	21.2.39	14½	4,237	6·19	262·45	230	Jr. 2 ..	.. ..	Windrest Prince Madeira
Henderson, W., Grasmere, Ayrshire (1).										
Carracoorte Briar Bud 3rd	C.R.	5.1.39	17½	5,109	4·53	231·65	350	Mature	.. ..	Grand View Bernie
Hore, E., Leitchville, Jersey (1).										
Taranah Rosleaf 4th ..	37589	19.2.39	25	8,096	5·11	413·36	350	Mature	445, 450, 525, 489	Taranah Submarine
Hore, M. T., Horfield, Friesian (1).										
Elmar Ideal Patch ..	3973	27.1.39	31	10,532	2·83	298·07	350	Mature	320, 377, 431, 337	Greenvale Oakwood Posch
Huffer, J. A., Gormandale, Jersey (1).										
Glen Valley Royal Rose 3rd	Vol. 26	21.3.39	14	4,857	5·90	286·69	250	Sr. 2	.. ..	Brucevale Wyandotte's King
Hurrey, Estate of the late W. H., Koonwarra, Jersey (5).										
Kooreena Lady 8th ..	58056	12.1.39	28½	7,136	6·04	430·86	310	Jr. 4	317 ..	Kooreena Mourier King 2nd
Kooreena Maranta 18th ..	C.R.	11.2.39	13	4,374	6·59	288·41	230	Jr. 2 ..	..	Kooreena Good Luck
Kooreena Minerva 4th's Venus	Vol. 26	7.2.39	19	5,662	5·36	303·70	230	Jr. 2 ..	..	Kooreena Handsome Laddie
Kooreena Mourier Queen 9th	49037	16.1.39	26	5,943	5·69	338·29	350	Mature	311, 410, 358	Kooreena Carrie 3rd's Delegate
Kooreena Yo Yo 4th ..	Vol. 26	1.1.39	22½	5,673	6·22	353·13	230	Jr. 2 ..	..	Kooreena Good Luck
Jones, A. C., Barnawartha, Illawarra, Shorthorn (3).										
Aralabrad Champion 7th ..	6642	7.3.39	22½	7,833	4·23	331·12	350	Mature	.. ..	Headlight of Aralabrad
The Forest Ruby 4th ..	22772	27.12.38	18½	6,620	4·26	282·08	350	Mature	.. ..	Despatch of The Forest
Wangoola Venus ..	Vol. 7	1.1.39	5½	3,920	4·03	157·84	330	Sr. 4	.. ..	The Forest Discovery
Leask, G. C., Garfield, Ayrshire (1).										
Gowrie Park Naughty ..	31483	12.3.39	11	7,008	4·16	291·50	290	Sr. 3	270 ..	Gowrie Park Scottish Piper
Le Noury, E., Werribee South, Guernsey (1).										
Werribee Milkmaid ..	6483	5.2.39	11½	5,478	4·74	259·51	250	Sr. 2	225 ..	Werribee Prince Don
Longerenong Agricultural College, Dooen, Ayrshire (2).										
Longerenong Laureate ..	26557	18.2.39	12	5,897	3·99	235·46	350	Mature	347, 300, 234, 398, 394, 293	Lily's Lad of Holly Green
Longerenong Palm 4th ..	29742	13.3.39	19	8,384	3·70	310·09	270	Jr. 3	239 ..	Dookie Punch
Lyon, C. G., Heidelberg, Jersey (2).										
Banyule Silvermine 94th ..	47128	2.1.39	23½	6,453	6·60	426·02	310	Jr. 4	312, 393 ..	Banyule Supreme
Banyule Tiddlewink's 26th	56270	18.3.39	26	8,451	6·05	511·38	230	Jr. 2 ..	.. ..	Banyule Oxford Don
Macauley, C. W., Rochester, Jersey (1).										
Taranah Radiance 2nd ..	59634	2.3.39	23½	9,279	5·67	526·53	290	Sr. 3	348, 364 ..	Taranah Commander
McCosh, S. J., Wandin North, Jersey (2).										
Heathermont Brilliant Promise	48638	11.3.39	23	6,189	6·24	386·18	350	Mature	234, 299 ..	Staghorn Promise's Masterpiece
Heathermont Countess Tex	57664	4.3.39	21½	6,620	6·08	402·67	270	Jr. 3	265 ..	Glen Valley Masterman

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
McNabb, G. A. and Son, Irrewillipe East, Jersey (3).										
Maxon Cornice	40931	25.3.39	18	5,522	6·40	353·45	350	Mature	387, 387, 407	Maxon Mercedes Chief 4th
Maxon Noble's Goldfinch ..	45069	7.3.39	25	7,905	5·40	426·96	350	Mature	331, 372, 478, 422	Avalon Noble 8th
Maxon Noble's Pansy 2nd	54027	25.3.39	18	6,102	5·41	330·15	330	Sr. 4	248, 316, 339	Avalon Noble 8th
Mesley, W. T., Dalyston, Jersey (5).										
Warenda Caroline ..	C.R.	2.2.39	N.O.C.	3,929	6·26	246·09	230	Jr. 2	.. ..	Strathbow Cavalier
Warenda Gazelle 19th ..	C.R.	1.2.39	12	4,296	5·57	239·20	230	Jr. 2	.. ..	Riverbank Royal Exchange
Warenda Madrigal 7th ..	64812	10.1.39	14	4,430	6·70	296·74	250	Sr. 2	283 ..	Warenda Snap
Warenda Mandolin 18th ..	C.R.	22.2.39	N.O.C.	3,639	5·75	209·30	230	Jr. 2	.. ..	Riverbank Royal Exchange
Warenda Meadow Queen 7th	C.R.	30.1.39	12½	4,711	5·81	273·71	250	Sr. 2	.. ..	Warenda Perpetuate
Mitchell, R. H., Linton, Jersey (4).										
Clifford Farm Gloria ..	Vol. 26	30.1.39	25	7,062	5·53	390·40	270	Jr. 3	.. ..	Clifford Farm Flashlight
Clifford Farm Janice ..	61101	24.2.39	27	6,953	6·40	444·78	270	Jr. 3	442 ..	Wompini V.C.
Clifford Farm Mercia ..	56820	1.3.39	33	9,040	5·78	522·88	310	Jr. 4	422 ..	Wompini V.C.
Clifford Farm Pussy Willow	Vol. 26	12.3.39	23½	6,879	5·22	359·33	230	Jr. 2	.. ..	Clifford Farm Danny Boy
Moore, J. and Co., Yarram, Jersey (12).										
Clarendon Eyre Camille 11th	56799	9.3.39	30	8,766	5·44	476·76	310	Jr. 4	298, 336 ..	Victorious Pioneer (Imp.)
Clarendon Eyre Rose Marie 12th	56810	1.3.39	13½	4,841	5·11	247·48	310	Jr. 4	254, 229 ..	Clarendon Eyre Oxford Gamboge
*Tooloonook Boltonia 5th ..	46463	19.3.39	4	5,430	4·53	245·73	350	Mature	316, 323, 283, 270, 238	Tooloonook Clianthus Hero
Tooloonook Heather 4th ..	59755	17.3.39	26½	6,986	5·07	354·49	350	Mature	240, 312, 307	Tooloonook Plumbago's Hero
Tooloonook Molly 11th ..	59757	24.2.39	16	5,613	5·15	289·04	310	Jr. 4	240, 269 ..	Tooloonook Angler's Hero
Tooloonook Molly 12th ..	59758	28.2.39	19	6,352	5·07	322·05	310	Jr. 4	256, 241 ..	Anfield Diadem's Masterpiece
Tooloonook Molly 14th ..	Vol. 26	14.3.39	15½	6,227	4·52	281·19	270	Jr. 3	210 ..	Tooloonook Carob's Hero
Tooloonook Molly 16th ..	Vol. 26	28.3.39	11½	4,314	6·19	266·85	230	Jr. 2	.. ..	Latrobe Musician
Tooloonook Onyx ..	Vol. 26	2.3.39	21	5,418	5·58	302·28	230	Jr. 2	.. ..	Rydon Premier
Tooloonook Peach 8th ..	64599	4.3.39	21	5,063	5·73	290·29	270	Jr. 3	228 ..	Tooloonook Carob's Hero
Tooloonook Plumbago 4th	42249	9.3.39	14	6,881	4·49	303·69	350	Mature	263, 311, 348, 288, 271	Somerville Beauty 4th's Command
Tooloonook Sainfoin 3rd ..	50888	4.3.39	14	5,231	5·17	270·20	350	Mature	245, 248, 262	Heroic of Somerville
Nancarrow Bros., Kerang, Jersey (1).										
Pine Ridge Silvermine 4th	63734	1.2.39	23	8,258	5·66	467·49	250	Sr. 2	295 ..	Duke of The Lake (Imp.
Nicholas, M. A., Sherbrooke, Jersey (1).										
Brampton Champion Miss (Imp.)	56042	13.2.39	11½	4,645	5·87	272·89	270	Jr. 3	235 ..	Brampton Son of Champions
Nilsson, P. O., Tynong, Jersey (1).										
Yanguren Bluebell's Rose	51368	27.2.39	34	9,912	4·84	479·96	350	Mature	362, 403 ..	Rosyth Romany Prince
Noble, T. M. and Sons, Maffra, Jersey (2).										
Finchley Canary 3rd ..	37092	14.3.39	24½	7,901	5·89	465·03	350	Mature	354, 565, 509, 635, 549, 583, 519	Werribee Lord Burnham
Finchley Lillian	57279	20.2.39	23	7,254	6·62	480·05	350	Mature	421, 425 ..	Werribee Lord Burnham
O'Neill, J., Echuca Village, Jersey (2).										
Fourshells Yvette ..	38349	16.3.39	21	7,017	5·34	374·37	350	Mature	490, 436, 405, 374, 365	Belgonia Propeller
Strathbow Heather Belle	29326	17.1.39	16½	6,754	6·05	408·47	350	Mature	362, 503, 546, 469, 399, 499, 411	Studleigh Noble
Parks, Fraser E., Merton, Jersey (1).										
Murona Petal 6th ..	49737	13.1.39	20	7,311	4·49	328·19	350	Mature	.. ..	Banyule Airpoise
Pattison, F., Tongala, Ayrshire (1).										
Willow Park Rosina ..	26810	22.1.39	11½	8,231	4·21	346·75	350	Mature	278, 376, 355	Fulham Beam
Payne, A. E. T., Lilydale, Guernsey (10).										
Rose Gem of Maple Lodge (Imp.)	3933	26.1.39	48½	13,803	6·20	856·37	350	Mature	608, 514 ..	Conqueror
Yarraview Beryl ..	8197	19.3.39	32½	8,723	5·56	484·99	250	Sr. 2	.. ..	Honoria's Benefactor (Imp.)
†Yarraview Charmuse ..	6629	15.3.39	..	6,600	5·56	366·94	250	Sr. 2	385 ..	Honoria's Benefactor (Imp.)
Yarraview Citron ..	3550	14.2.39	24	10,439	5·74	599·28	350	Mature	345, 360, 663	Woodlands-Fluer-de-Lys (Imp.)
Yarraview Ella	5168	5.2.39	33½	11,651	5·34	622·74	350	Mature	534, 418, 685	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Essie ..	5169	17.3.39	24½	9,719	5·24	509·51	350	Mature	292, 346, 583	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Estelle ..	8206	18.1.39	26	6,839	4·70	321·59	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Jean	8212	7.1.39	9½	4,514	6·10	275·52	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
†Yarraview Jennie ..	5172	18.2.39	..	6,975	5·26	367·19	350	Mature	402, 481, 459	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview Royal ..	6642	18.1.39	19	7,904	4·87	385·16	270	Jr. 3	431 ..	Yarraview Sunrise

* 240 days in test. † 240 days in test (sold).

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Phillips, J. H., Speewa, Jersey (2).										
Rylands Golden Glory ..	C.R.	28.12.38	12	4,580	4·62	211·80	230	Jr. 2	.. ..	Banaview Master
The Wattle's Hazel ..	37345	4.1.39	9	5,531	4·57	252·50	350	Mature	255, 215, 278	Prince of The Wattles
Powell, T. S., Mansfield, Jersey (2).										
Mornmoot Northwood Madeira 3rd	41129	1.2.39	22	8,344	5·49	458·49	350	Mature	450, 365 ..	Werribee Prince Madeira
Navuloa Master's Encore ..	Vol. 26	30.12.38	24	7,278	5·30	385·76	270	Jr. 3	.. ..	Werribee Grandmaster
Read, Estate of the late J. D., Springhurst, Jersey (3).										
Springhurst Boutillere ..	64270	15.2.39	19	6,363	5·28	335·82	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Springhurst Ronald's Duchess	64283	27.3.39	29	9,386	5·27	495·10	230	Jr. 2	.. ..	Springhurst Sybil's Successor
Springhurst Xenia's Narcissus	64289	12.2.39	12½	4,441	5·17	229·43	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Richardson, W. S., Bacchus Marsh, Jersey (5).										
Gladfield Princess Kitty ..	61677	13.1.39	24	5,708	5·21	302·36	270	Jr. 3	205 ..	Grangelea Dandy Mac
Grangelea Damsel 4th ..	57536	12.1.39	19	4,488	6·46	289·80	270	Jr. 3	245 ..	Grangelea Daffodil's Airo
Sutton Lea Airmite ..	38135	13.2.39	19	6,762	4·85	328·22	350	Mature	294, 393, 345, 309, 387, 285	Banyule Petalon 2nd
Sutton Lea Marmie ..	59583	22.1.39	21	5,970	5·38	321·28	310	Jr. 4	246 ..	Sutton Lea Garnap
Sutton Lea Pariel 3rd ..	50726	21.1.39	22	6,876	5·82	400·01	350	Mature	315, 384, 294	Sutton Lea Garnap
Salesian College, Sunbury, Friesian (5).										
Braemore Princess Domino 7th	Vol. 14	5.1.39	31½	14,949	4·10	612·28	310	Jr. 4	381 ..	Turepo Prince Domino (Imp.)
Glenloth View Dekol ..	Vol. 14	10.1.39	20½	18,102	3·77	682·66	350	Mature	.. ..	Roads End Cato
Ingolston Domino's Beauty	3528	31.1.39	4	14,273	3·75	535·53	350	Mature	387, 341, 578, 600	Ingolston Dutch Domino
Ingolston Ena	4093	23.3.39	19½	13,359	3·39	452·89	350	Mature	281, 384, 468	Greenvale Ideal Segis
Tulla Pontiac Lady ..	Vol. 14	2.1.39	32	10,610	3·63	384·99	350	Mature	372, 421, 376	Clarendon Eyre Inka Pontiac
Shearman, A. and W., Darnum, Jersey (1).										
Clarendon Eyre Pinafore 11th	Vol. 26	2.1.39	22	7,453	5·31	395·93	270	Jr. 3	306 ..	Clarendon Eyre Oxford Dreamer
Shearn, J., Jindivick, Jersey (1).										
Somerville Rio Rita 9th ..	Vol. 26	1.3.39	13½	4,382	6·45	282·63	230	Jr. 2	.. ..	Bramption Pioneer Chief (Imp.)
Smith Bros., Mirboo North, Jersey (1).										
Sylvan Hill Golden Tissue	Vol. 26	6.3.39	15	4,502	5·57	250·68	250	Sr. 2	.. ..	Glen Iris Bow Bells
Stephens, Dr. F. G., Vermont, Guernsey (1).										
Roads End Antoinette ..	3409	15.1.39	15	6,573	4·61	303·14	350	Mature	398, 340 ..	Glenburnie Ideal (Imp.)
Tait, W. G., Dreeite, Jersey (1).										
*Glen Iris Belladonna ..	39834	28.12.38	4	2,730	4·23	115·39	350	Mature	269 ..	Glen Iris Bow Bells
Tomasetti, B. G., Drouin West, Ayrshire (3).										
Glen Athol Merry Lass ..	C.R.	23.2.39	25	7,640	4·40	335·96	270	Jr. 3	259 ..	Glencorren Merry Lad
Glencorren Elva ..	C.R.	26.3.39	15	5,832	4·79	279·40	230	Jr. 2	.. ..	Scotswood Flashlight
Glencorren Margaret ..	28446	24.2.39	14½	7,281	4·43	322·40	350	Mature	303, 315, 349	Scotswood Michael 2nd
Trevaskis, F. T., Tongala, Jersey (2).										
Ballara Flower 6th ..	56226	27.3.39	22	7,352	5·54	407·30	290	Sr. 3	228 ..	Kyora Dream's Gadget 2nd
Ballara Ideal 5th ..	47094	12.2.39	26½	7,242	4·92	356·19	350	Mature	334 ..	Ballara Fancy's King
Wade, W. J., Stratford, Jersey (1).										
Banyule Molly 36th ..	34187	1.1.39	32	9,905	4·82	477·03	350	Mature	414, 498, 455	Concentration of Banyule
Walker, C. S., Swan Hill, Friesian (5).										
Warwick Lizzie Oakwood	Vol. 14	13.1.39	27½	17,843	2·98	532·12	350	Mature	302, 487 ..	Hengest Matador Walker
Warwick Maggie Walker ..	Vol. 14	19.3.39	41	17,547	3·52	618·25	350	Mature	272, 383 ..	Hengest Segis Lizzie
Warwick Maggie Woodcrest	C.R.	16.3.39	55	20,378	3·12	635·87	350	Mature	265, 352, 394	Greenvale Woodcrest Oakwood 2nd
Warwick Matador Poppy ..	Vol. 14	12.2.39	23½	7,751	3·15	243·83	230	Jr. 2	.. ..	Hengest Matador Walker
Warwick Violet Oakwood	Vol. 14	26.2.39	20½	11,757	3·26	382·85	350	Mature	366 ..	Greenvale Woodcrest Oakwood 2nd
Walker, C. S., Swan Hill, Jersey (2).										
Warwick Augustus Marie 7th	Vol. 26	18.3.39	20	4,745	4·90	232·73	230	Jr. 2	.. ..	Warwick Golden Lord
Warwick Cream Stockings 2nd	Vol. 26	11.2.39	20½	5,798	5·76	334·24	230	Jr. 2	.. ..	Warwick Golden Lord

* 150 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Warragul High School, Warragul, Red Poll (1).										
*Gipps Christina ..	2874A	29.1.39	4	5,250	4·39	230·67	350	Mature	249, 230, 358, 300, 240, 254	Woodburn Laureate
Williams, F. A., Bamawm Extension, Jersey (1).										
Bamawm Bonnie Lass ..	47099	10.1.39	23	7,131	6·46	460·62	350	Mature	419, 489	Bamawm Leon
Wilson, A., Port Fairy North, Ayrshire (2).										
Carracoorte Blanche 12th	29202	14.3.39	16	5,330	4·63	246·75	350	Mature	243, 267 ..	Carracoorte Gerty's Producer
Green Vale Rosebloom 6th	28555	15.3.39	16½	6,824	4·16	283·76	350	Mature	307, 343 ..	Carracoorte Squire

* 210 days in test.

T. Rider, Government Printer, Melbourne.

List of Fungicides, Insecticides, Vermin Destroyers, and Weed Destroyers

Registered at the Office of the Director of Agriculture, under the Fungicides Act 1935 (*No.* 4295), *for the year* 1940

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).				Manufacturer or Wholesale Dealer.
	Arsenic Pentoxide (As_2O_5) Calculated on the Dry Basis.		Acidity Calculated as Nitric. Dry Basis.	Content of Water.	
	Total.	Water Soluble.			
Arsenate of Lead (Paste).	Minimum. %	Maximum. %	Maximum. %	Maximum. %	
Aero	31·5	·25	·2	50·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Avery's	32·0	·50	·2	50·0	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Berger's Mercury	31·0	·50	·2	50·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
" (Colloidal)	31·0	·50	·2	50·0	" " " " "
Blue Bell	31·0	·50	·2	50·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	31·0	·50	·2	50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31·0	·50	·2	50·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Ramtre	31·5	·2	·2	50·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo	32·0	·50	·2	50·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	32·0	·50	·2	50·0	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Cooper's	31·0	·50	·2	50·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Victor	32·0	·50	·2	50·0	F. R. Mellor, 452 Queen-street, Melbourne
Carlton	32·0	·50	·2	37·0	" " " " "
Arsenate of Lead (Powder).					
Aero	31·5	·25	·2	..	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Avery's	32·0	·50	·2	..	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Blue Bell	31·0	·50	·2	..	Blyth Chemicals Ltd., 31 Queen-st., Melb.
Cooper's Arsinette	31·0	·50	·2	..	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Elephant	31·0	·50	·2	..	Jaques Pty Ltd., 31 Queen-street, Melbourne
Lion	31·0	·50	·2	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Unity	32·5	·50	·2	..	T. E. Butler, 486 Collins-street, Melbourne
Summit	32·0	·50	·2	..	" " " "
Ramtre	31·5	·25	·2	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Ortho Standard	31·0	·50	·2	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Plane	31·0	·50	·2	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	32·0	·50	·2	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	32·0	·50	·2	..	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Corona	31·0	·50	·2	..	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Sigma	32·0	·50	·2	..	Sigma Co. Ltd., 562 Little Bourke-st., Melb.
Victor	32·0	·50	·2	..	F. R. Mellor, 452 Queen-street, Melbourne
Berger's Mercury	31·0	·50	·2	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Calcium Arsenate.					
Avery's	40·0	..	..	..	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Elephant	40·0	..	..	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	40·0	..	..	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo	40·0	..	..	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	40·0	..	..	..	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Sigma	40·0	1·00	..	..	Sigma Co. Ltd., 562 Little Bourke-street Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Sulphate of Copper (Bluestone).		
Commonwealth	Copper (Cu) 25·0 %	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Blyth's	" 24·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Jaques'	" 24·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Macclesfield	" 25·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne, C.1
Pannifex	" 25·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
" Instant	" 25·0	" " " "
Vallo (Lump)	" 25·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
" (Neige Crystals)	" 25·0	" " " " "
" (Powdered)	" 25·0	" " " " "
" (Bordeaux Manufacture)	25·0	" " " " "
Lion	25·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune Snow	" 25·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Faulding's	" 24·5	F. H. Faulding and Co. Ltd., 123–25 Lonsdale-street, Melbourne
E.S.A.	" 25·0	Elder Smith and Co. Ltd., 95 William-street, Melbourne
Macclesfield (R. and T.'s)	" 25·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" (Snow) (R. and T.'s)	" 25·0	" " " "
Hart's Sugar Bluestone	" 25·0	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Avery's	" 25·0	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Neptune	" 25·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne

	Percentage Copper (Cu)	Percentage Copper (Cu) Water Soluble.	Percentage through 200-mesh Sieve.	
Basic Copper Carbonate.				
Sickle	% 52·0	% Nil	% 99·0	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Smutol (Oxychloride)	52·0	Nil	99·0	" " " "
Vallo Anti-Bunt	50·0	·25	97·5	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Perinox (oxychloride)	50·0	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Soltosan (Oxychloride)	50·0	..	..	V. W. O'Keefe, 328 Flinders-street, Melbourne

Dry Bordeaux Mixture (Powder).		
Avery's	Copper (Cu) 12·50 %	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Lion	" 12·50	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo	" 12·50	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Coposil	" 18·50 (3·50 per cent. zinc)	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Ortho (Powdered)	" 12·75	" " "
X.L.	" 13·00	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Tip Top	" 12·50	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Burgundy or Copper-Soda.		
Vallo Burgundy Mixture	Copper (Cu) 12·5 %	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Lion Sporocide	" 12·5	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune Copper Spray	" 12·5	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Blue Bell	" 12·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	" 12·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Paris Green.		
Lion	Arsenious Oxide (As_2O_3) 55·0 %	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Felton, Grimwade, and Duerdin's	" " " 50·0	Felton, Grimwade, and Duerdin's Ltd., 342–6 Flinders-lane, Melbourne
Tip Top	" " " 55·0	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Faulding's	" " " 60·0	F. H. Faulding and Co. Ltd., 123–25 Lonsdale-street, Melbourne
Avery's	" " " 50·0	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Miscellaneous.		
Yarra Cheshunt Compound	Copper (Cu) .. .. 5·0 %	J. Parsons and Co., 155 Yarra-street, Abbotsford
Faulding's (London Purple)	Arsenious Oxide (As_2O_3) 44·0 %	F. H. Faulding and Co. Ltd., 123–25 Lonsdale-street, Melbourne
Cooper's Bordinette	Copper (Cu) .. .. 12·7 %	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Schloesings Bouillie	" .. .. 12·7 %	Lawford's Fruit Exchange Pty. Ltd., Doncaster, Victoria
Bouisol	" .. .. 15·0 %	" " " " "
Lime.		
Neptune	Available Lime (CaO) 80 %	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Pannifex Bordeaux Rock	" " " 80 %	Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Vallo Selected	" " " 80 %	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne

	Thio-Sulphate Sulphur.	Poly-Sulphide Sulphur.	Total Soluble Sulphur.	
	Weight in Volume.			
Concentrated Lime-Sulphur (Solution).	%	%	%	
Avery's	2·5	20·0	28·0	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Blue Bell	2·5	20·0	28·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	2·5	20·0	28·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	2·5	20·0	28·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	2·5	20·0	28·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Pannifex	2·5	20·0	28·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Vallo	2·5	20·0	28·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
X.L.	2·5	20·0	28·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Tip Top	2·5	20·0	28·0	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Unity	2·0	20·0	28·0	T. E. Butler, 486 Collins-street, Melbourne
L.F.X.	1·5	21·0	28·0	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Victor	2·5	20·0	28·0	F. R. Mellor, 452 Queen-street, Melbourne
XL. Dry Lime—Sulphur Powder	2·5	40·0	55·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne

	Sulphur.	Calcium Hydrate.	
Lime and Sulphur (Dry Mix).	%	%	
Essen (No. 1)	62·0	..	Essen Chemical Bye Products Co. Pty. Ltd., 403–405 Neerim-road, Murrumbeena
" (No. 2)	46·0	..	" " " "
Pannifex	62·5	35·5	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Vallo	64·0	35·6	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
X.L.	66·0	33·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne

Sulphur.	%		
Commonwealth (Dusting)	Sulphur 90·0		Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
" (Powdered)	" 99·5		" " " " "
" (Atomic Dusting)	" 90·0		" " " " "
" (Atomic)	" 99·5		" " " " "
" (Wetomic)	" 97·0		" " " " "
Flotox (Wettable)	" 98·0		H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Lion (Atomic)	" 95·0		Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune (Powdered)	" 99·0		Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Vallo (Powdered)	" 99·5		Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
" (Dusting)	" 90·0		" " " " "
" (Wettable)	" 98·0		" " " " "
" (Colloidal)	" 50·0		" " " " "
Cooper's (Colloidal)	" 50·0		Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Sulphur—continued.		
Plane (Dusting)	„ 90·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Ramtre[illegible]ust No. 39)	„ 90·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
X.L. (Atomic)	„ 75·0	„ „ „ „ „
Neptune Chemical 23371	„ 50·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Pannifex Atomic Dusting No. 31	„ 90·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Blue Bell (Colloidal)	„ 50·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant (Colloidal)	„ 50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Avery's Dusting	„ 90·0	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Tromax (Sublimed)	„ 99·0	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Arnold Sulphur Cartridge	„ 35·0	E. H. Page, 1264 High-street, Malvern
Nicotine Sulphate.	%	
Avery's	Nicotine 40	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Blue Bell	„ 38	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Cooper's	„ 40	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Elephant	„ 40	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	„ 38	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Pannifex	„ 40	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Plane	„ 40	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	„ 40	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top (Black Leaf 40)	„ 40	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Black Leaf 40 (P.D.S.)	„ 40	Producers Co-operative Distributing Society Ltd., 180 Franklin-street, Melbourne
„ „ „ (Neptune)	„ 40	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
T.B.B in diamond	„ 40	T. E. Butler, 486 Collins-street, Melbourne
L.F.X.	„ 38	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Grazcos	„ 40	The Graziers' Co-operative Shearing Co. Ltd., 90–92 William-street, Melbourne
Railton's	„ 40	James Railton, 133 Elizabeth-street, Melbourne
Sigma	„ 40	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Hart's	„ 40	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Cole's	„ 40	G. J. Coles and Co. Ltd., 282 Little Collins-street, Melbourne
Triumph	„ 40	F. R. Mellor, 452 Queen-street, Melbourne
Britnico	„ 40	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Nik-kof	„ 38	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Ibis	„ 38	Federal Chemicals Pty. Ltd., Flockart-street, Abbotsford
Faulding's	„ 40	F. H. Faulding and Co. Ltd., 123 Lonsdale-street, Melbourne
Tar Distillate.	%	
Cooper's Ovicide	Tar Oils 48; Phenols 10; Mineral Oil 20	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Vallo Ovicidal Wash	Emulsifiable Oils 89	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
I.C.I. (No. 1)	Tar Oil 70	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
„ (No. 2)	„ „ 35; Mineral Oil 35; Tar Oils 50	„ „ „ „ „
L.F.X.	Mineral Oils 20; Phenols 10	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Blue Bell	Emulsifiable Oils 89	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	„ „ 89	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Benzol Emulsion.	%	
Avery's	Benzol 30	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Vallo	„ 30	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
White Spraying Oil or Emulsion.		
Avery's	White Mineral Oil 80·0 %	Avery's Garden Insecticide Co., 67 Burnley street, Richmond
Blue Bell	" " " 82·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Cooper's Alboleum	" " " 80·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Elephant	" " " 82·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoyle	" " " 82·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Kleenup	" " " 83·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Lion	" " " 80·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	" " " 85·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
" (Clarifol)	" " " 85·0	
Vallo (Prepared)	" " " 89·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Volok	" " " 83·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
White Spray	" " " 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
X.L.	" " " 80·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Tip Top	" " " 80·0	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
L.F.X.	" " " 80·0	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Unity	" " " 82·5	T. E. Butler, 486 Collins-street, Melbourne
Ibis	" " " 82·5	Federal Chemicals Pty. Ltd., Flockhart-street, Abbotsford
Pale Spraying Oil.		
Gargoyle	Pale Mineral Oil 82·0 %	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Neptune Palsol	" " " 85·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Shell Pale-Spray	" " " 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Shellicide D.	" " " 85·0	
Vallo	" " " 82·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Red Spraying Oil.		
Avery's	Red Mineral Oil 85·0 %	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Blue Bell (Prepared)	" " " 85·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant (Prepared)	" " " 85·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoyle	" " " 85·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Lion (Prepared)	" " " 80·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune "A"	" " " 85·0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
" "C"	" " " 70·0	
Shell Red Spray	Red Mineral Oil 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
" "C"	" " " 70·0	
Tip Top (Prepared)	" " " 86·0	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Vallo	" " " 86·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
X.L. (Prepared)	" " " 85·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
X.L. (Prepared Dark Red)	" " " 85.0	
Harbas	" " " 75·0 (and 5·5% Tar Acid)	Lawford's Fruit Exchange Pty. Ltd., Doncaster
L.F.X.	" " " 85·0	T. E. Butler, 486 Collins-street, Melbourne
Unity	" " " 85·0	
Pannifex	" " " 83·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Ibis	" " " 85·0	Federal Chemicals Pty. Ltd., Flockhart-street, Abbotsford
Crude Spraying Oil.		
Neptune	Mineral Oil 85·0 %	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Unity	" " 85·0	T. E. Butler, 486 Collins-street, Melbourne
X.L. (Prepared)	" " 80·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
X.L.	" " 100·0	
Vallo	" " 83.0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Arsenic (Oxides).	%	
Vallo (White)	Arsenic (As_4) 75·37; (As_2O_4) 99·50	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
„ (Pentoxide)	Arsenic Pentoxide (As_2O_5) 83·00	„ „ „ „ „
Faulding's (White)	Arsenic (As_2O_3) 98·00	F. H. Faulding and Co. Ltd., 123-25 Lonsdale-street, Melbourne
Hart's	„ (As_2O_3) 99·5	Hart and Co. Pty. Ltd., Clarendon and Whiteman streets, South Melbourne
Felton Grimwade and Duerdin's	„ „ 98·00	Felton Grimwade and Duerdins Ltd., 342–6 Flinders-lane, Melbourne
Miscellaneous.	%	
Sickle Formalin	Formaldehyde 38·00	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Faulding's Formalin	„ 37·00	F. H. Faulding and Co. Ltd., 123–25 Lonsdale-street, Melbourne
Tromax Formalin	„ 38·00	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Felton Grimwade & Duerdin's Formalin	„ 38·00	Felton Grimwade & Duerdins Ltd., 342–6 Flinders-lane, Melbourne
Sickle Carbon Bisulphide	Carbon Bisulphide 99·00	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Vallo (Orchard Tree Bands)	Beta-Naphthol 20·00	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Kilkod Orchard Tree Bands	„ 18·0	F. R. Mellor, 452 Queen-street, Melbourne
Shirlan "R.A."	Salicylanilide 8·40	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
„ "A.G."	„ 25·00	„ „ „ „ „
„ W. S.	Sodium Salicylanilide 98·00	„ „ „ „ „
Hortosan	Mercury 20·0	„ „ „ „ „
Jeyes Soil Sterilising Powder	Phenol 7·50; Chlorinated hydrocarbons 4·00	Federal Chemicals Pty. Ltd., Flockhart-street, Abbotsford
Ceresan	Mercury 1·50	Dalgety and Co. Ltd., 461–71 Bourke-street, Melbourne
Verdasan, D.	„ 15·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Hortosan Potato Dip	Organo Mercurial Compounds 14·6	„ „ „ „ „
Germisan	Sodium salt of Cyan-mercury cresol 30·00; Sodium chloride 60·00	N. N. McLean Pty. Ltd., 305 Queen-street, Melbourne
Tuberol	Stearoptenes and Oleoptenes 70·00	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Pannifex Worm Killer	Sodium Hypochlorite 6·50	„ „ „ „ „
„ Harlequin Bug Killer	Mineral Oil 10·00; Stearoptenes and Oleoptenes 10·00	„ „ „ „ „
Cooper's Worm Killer	Saponaceous Vegetable Matter 33·33	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Champion Manurial Insecticide and Fungicide	Naphthalene 10·00; Stearoptenes and Oleoptenes 3·00; Tar Acids 1·00; Sulphur 3·00; Copper ·60	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Kill-A-Mite Manurial Insecticide (coarse)	Phenol 2·50; Naphthalene 2·50; Hydrocarbon oils 5·00	Avery's Garden Insecticide Co., 67 Burnley street, Richmond
Cooper's Apterite	Naphthalene 18·00	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
„ Soil Sterilizer	Tar Acids 44·00; Neutral Tar Oils 29·00	„ „ „ „ „
Slugdie	Nicotine ·40; Naphthalene 10·00	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
X.L.All (Fumigating Tablets)	Nicotine 27·00	Law Somner and Co. Pty. Ltd., Elizabeth-street, Melbourne
Derridust	Tuba Toxin 2·00	Houghton and Byrne Pty. Ltd., 268 Flinders-street, Melbourne
Tipulite	Naphthalene 31·00; Ferric Sulphide 18·00	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Tip Top Kill-all	Nicotine ·12	„ „ „ „ „
Clensel	Oil of Citronella 2·00; Ammonia 2·30; Potash Soap 60·00	Clensel Products Pty. Ltd., Youell and Cowper streets, Footscray
Slugtox	Metaldehyde 1·00	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Sure Death	„ 1·20	C. A. Schache, North Shore, Geelong
Defender	„ 1·25	D. S. C. Pearson, 450 Little Collins-street, Melbourne
Beta Bait	„ 1·25	J. A. McLean, 16 Cardigan-street, East St. Kilda
Brown Magic Slug and Snail Killer	„ 1·00	E. H. Page, 1264 High-street, Malvern

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
***Miscellaneous*—continued.**		
Grenedeth	Nicotine 0·58; Sulphur 18·19; Paradichloro benzene 2·27; Residual Oil 4·22; Naphthalene 2·60	E. H. Page, 1264 High st., Malvern
Ideal Slug and Snail Killer	Arsenic Pentoxide (As_2O_5) 2·00	" " " "
Antipestick	Nicotine 40·00	" " " "
Nicotine Dusting Powders.	%	
G. J. Coles and Co. Tobacco Dust	Nicotine ·65	G. J. Coles and Co. Ltd., 282 Little Collins-street, Melbourne
Pestend	" ·50	W. D. and H. O. Wills (Aust.) Ltd., 411–423 Swanston-street, Melbourne
Pestide	" ·50	" " " " "
Plane Nicodust	" 2·50	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 3	" 3·00	" " " " "
" " No. 5	" 5·00	" " " " "
Elephant Duston No. 1	" 4·00	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Ramtre No. 4	" 2·00	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
" No. 5	" 3·00	" " " " "
" No. 6	" 4·00	" " " " "
Vallo N.40	" 2·50	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Pannifex Niko Dust, No. 1	" 2·00	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
" " " No. 2	" 2·50	" " " " "
" " " No. 3	" 3·00	" " " " "
" " " No. 4	" 5·00	" " " " "
Pesto Tobacco Dust	" ·65	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Pinnacle	" 1·50	" " " " "
Pannifex Tobacco Dust, No. 1	" 1·50	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
" " " No. 2	" ·65	
Arsenical Dusting Powders.	%	
Plane "A.P." No. 1	Arsenic Pentoxide (As_2O_5) 6·20	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" "A.P." No. 25	" " " 7·75	" " " " "
" "A.P." No. 33	" " " 10·20	" " " " "
" "A.P." No. 50	" " " 15·50	" " " " "
	%	
Ramtre No. 17	Arsenic Pentoxide (As_2O_5) 8·00	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
" No. 19	" " " 16·00	" " " " "
Vallo "A.L." 30	" " " 9·60	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
" "A.L." 50	" " " 16·00	" " " " "
Pannifex Lead Arsenate No. 5	" " " 6·20	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
" " " No. 6	" " " 7·75	" " " " "
" " " No. 7	" " " 10·20	" " " " "
" " " No. 8	" " " 15·50	" " " " "
Miscellaneous Dusting Powders.		
Plane Coppodust	Copper (Cu) 8·75	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Ramtre No. 14	" 8·00	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Arresto	Sulphur 9·00; Anhydrous Ferrous Sulphate 9·00; Arsenic Pentoxide ·40; Slaked Lime 75·00	Law Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Tip Top Grubbo		" " " " "
Pannifex Copper Dust No. 9	Copper (Cu) 8·75	Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Cooper's Kataklila	Rotenone and Allied Substances 3·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" Drymac	" " " " 1·00	" " " " "
" " Extra Light	" " " " 2·00	" " " " "
Banexo	Tar Oil 5·60	D. Walker, Waverly Lime Works, Lara
Plane Pearmite No. 1	Nicotine 1·00; Tar Oil 4·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 2	Nicotine 2·50; Tar Oil 4·00	" " " " "

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).				Manufacturer or Wholesale Dealer.
	Nicotine.	Arsenic Pentoxide (As_2O_5).	Copper (Cu).	Sulphur.	
Miscellaneous Dusting Powders—continued.	%	%	%	%	
Elephant Duston No. 2	1·2	5·00	..	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Plane "A.P." No. 25N	2·0	7·75	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" "A.P." No. 50N	2·0	15·50	..	..	" " " " "
" "A.P." No. 25N$_2$	3·0	7·75	..	..	" " " " "
" "A.P." No. 50N$_2$	3·0	15·50	..	..	" " " " "
Ramtre No. 9	2·0	8·00	..	..	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
" No. 52	2·0	16·00	..	..	" " " " "
" No. 45	2·0	..	..	40·0	" " " " "
Plane "A.P." No. 2	..	4·65	..	75·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" "A.P." No. 3	..	4·65	3·00	40·0	" " " " "
" Seed Bed	2·0	7·75	4·00	..	" " " " "
" Coppodust with Lead Arsenate ..	..	7·75	8·75	..	" " " " "
" Azurine No. 1	..	..	4·00	50·0	" " " " "
" " No. 2	..	..	7·00	40·0	" " " " "
" " No. 4	..	..	11·00	35·0	" " " " "
" " with Lead Arsenate ..	..	6·20	7·00	40·0	" " " " "
" Tomato No. 50	..	15·50	4·00	40·0	" " " " "
" " No. 25	..	7·75	4·00	40·0	" " " " "
" " No. 3	..	15·50	..	40·0	" " " " "
Ramtre No. 21	..	6·00	6·00	30·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Vallo Tomato and Vegetable No. 1 ..	..	16·00	5·00	40·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
" " " " No. 2 ..	..	8·00	5·00	40·0	" " " " "
Pannifex Dual Control No. 10	2·0	4·65	..	..	H. C. Pannifex and Co., Pty. Ltd., 4 Dudley-street, Melbourne
" " " No. 11	2·0	6·20	..	..	" " " " "
" " " No. 12	2·0	7·75	..	..	" " " " "
" " " No. 13	2·0	9·30	..	..	" " " " "
" " " No. 14	2·0	15·50	..	..	" " " " "
" " " No. 15	3·0	7·75	..	..	" " " " "
" " " No. 16	3·0	9·30	..	..	" " " " "
" " " No. 17	3·0	15·50	..	..	" " " " "
" Dust " No. 18	..	4·65	..	75·0	" " " " "
" " " No. 19	..	4·65	3·0	40·0	" " " " "
" Seed Bed Dust, No. 20	2·0	7·75	4·0	..	" " " " "
" Copper and Sulphur, No. 21 ..	..	..	4·0	50·0	" " " " "
" " " No. 22 ..	..	..	7·0	40·0	" " " " "
" " " No. 23 ..	..	..	11·0	35·0	" " " " "
" " " No. 24 ..	..	6·20	7·0	40·0	" " " " "
" Tomato, No. 25	..	15·50	4·0	40·0	" " " " "
" " No. 26	..	7·75	4·0	40·0	" " " " "
" " No. 27	..	15·50	..	40·0	" " " " "
" Copper, plus L.A., No. 28 ..	..	7·75	8·75	..	" " " " "
" Peamite, No. 29	1·0	..	..	4·0 (Tar Oil)	" " " " "
" Afisdust, No. 30	2·5	..	..	4·0 (Tar Oil)	" " " " "
Ramtre Dust No. 13	..	..	5·0	25·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo N/AL 5–50	5·0	16·0	..	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
" " 3–30	3·0	9·6	..	..	" " " " "
Ramtre Dust No. 33	3·0	11·0	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" " No. 43	3·0	13·0	..	..	" " " " "
Aretan	..	..	3·50 (Methy-oxy-ethyl-mercuric chloride)	..	V. W. O'Keefe, 328 Flinders-street, Melbourne
Nu-Green	..	..	4·00 (Methy-oxy-ethyl-mercuric chloride)	..	" " " " "

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Blowfly Preparations.	%	
Allkon Blowfly Oil	Arsenic (As_2O_3) 1·30 Phenol and homologues 22·20 Eucalyptus Oil 8·70 Mineral Oil 20·00	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Bio-Fil-Di	Naphthalene 7·50 Benzol 13·70 Sulphur ·80 Cresylic Acid 8·40	The Nightingale Supply Co. Ltd., Ingle-street, Port Melbourne
Woollo	Neutral Tar Oils 80·00	Australian Estates Co. Ltd., 114 William-street, Melbourne
Defiance Blowfly Oil	Petroleum Oils 83·00 Coal Tar Derivatives 14·00 Essential Oils 3·00	The Shell Co. of Australia Ltd., 163 William-street, Melbourne
Immunol Blowfly Dressing	Arsenic (As_2O_3) 1·30 Phenol and homologues 22·20 Eucalyptus Oil 8·70 Mineral Oil 20·00	Hart and Co. Pty. Ltd., 84 Whiteman-street, South Melbourne
Way-bio	Eucalyptus Oil 16·00 Aldehydes 13·00 Terpenes 55·00 Ketones 16·00	W. K. Burnside Pty. Ltd., 34–44 Jeffcott-street, Melbourne
Welco	Vegetable Distillation Residue 20·00 Mineral Oil 80·00	Welch, Perrin and Co. Pty. Ltd., 48–56 Queen's Bridge-street, South Melbourne
Glycerine Di Boric	Boric Acid 21·5	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Shorthouse's Blowfly Oil	Castor Oil 21·5	A. H. Shorthouse, 4 Canning-street, Carlton
Osblo	Cresylic Acid 14·5 Phenol 3·0 Eucalyptus 1·0 Tar Oil 55·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Wilmo	Fish Oil 20·0 Bone Oil 20·0 Tetrachlorethylene 5·0	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
No-Blo	Eucalyptus Oil 30·0 Cresylic Acid 11·0 Paradi chlorobenzene 5·0 Oil (Sulph) 54·0 Cresylic Acid 10·0	Permewan Wright Ltd., 31 King-street, Melbourne
Dinkum Fly Oil	Eucalyptus Oil 5·0 Mineral Oil 35·0	Dytic Products Pty. Ltd., 4 Roden-street, Melbourne
Mag-o-Tol	Pine Oil 20·0 Cresylic Acid 4·0	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, City
Rudduck's Blowfly Oil	Cornu Cervi 47·0 Phenol 3·0 Resin 25·0 Castor Oil 15·0	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
K.S.D. Blowfly Oil	Cresylic Acid 20·0 Kerosene 25·0 Olein 15·0	K.S.D. Products, 229 Pt. Nepean-road, Gardenvale
Miscellaneous Pest Destroyers.	%	
Vallo Arsenate of Soda (for treatment of hides)	Arsenic Pentoxide (As_2O_5) 63·00	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Younghusband's Weevil Killer	Arsenic Pentoxide (As_2O_5) 63·00	Younghusband Ltd., 94–96 King-street, Melbourne
Faulding's Weevil Killer	Arsenic (As_2O_3) 50·00	Faulding and Co. Ltd., 123 Lonsdale-street, Melbourne

Distinguishing Name of Vermin Destroyer (Sheep Dip).	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Sheep and Cattle Dips (Arsenical).		
Cooper's Powder	Conforms with standard	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Edward's Powder	" " "	Primary Producers Chemicals Pty. Ltd., 430 Little Collins-street, Melbourne
Little's Powder	" " "	Wilcox Mofflin Ltd., 499 Little Collins-street, Melbourne
Quibell's Powder	" " "	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
Vacdip	" " "	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Sickle Powder	" " "	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Thomas' Carbolised	" " "	The Thomas Sheep and Cattle Dips Pty. Ltd. 47 Adam-street, Burnley
Vallo	" " "	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Vermin Destroyer (Sheep Dip).	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Sheep and Cattle Dips (Arsenical)—continued.		
Little's Tripolvos Powder	Conforms with standard	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
Lan-o-leen	" " "	The Graziers' Co-op. Shearing Co. Ltd., 90–92 William-street, Melbourne
Young's Powder	" " "	Strachan and Co. Ltd., Geelong
" Jason Liquid	" " "	" " "
Osmond's Viper Powder	" " "	Osmond and Son (Aust.) Ltd., 35 William-street, Melbourne
United	" " "	The Australian Estates Co. Ltd., 114–116 William-street, Melbourne
Dinkum Fluid	" " "	Dytic Products Pty. Ltd., 4 Roden-street, Melbourne
Dytic Powder	" " "	" " " " "
Dytic Fluid	" " "	" " " " "
Kleenflok	" " "	J. H. Rudd and Co. Pty. Ltd., 103–105 William-street, Melbourne
Miscellaneous Dips.		
Allkon	Arsenic (As_2O_3) 41·80%; Derris Ext. (Crude) 4·60; Arsenic (As_2O_3) 22·00; Rotenone and allied substances ·70	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Cooper's Quickacting Powder		New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
" Milk Oil Fluid	Phenol and Cresol 18·00	" " " " "
Hart's Immunol Super	Arsenic (As_2O_3) 24·5; Cresol 33·4; Oleo-resin (Derris) ·82; Cresols 58·00; Rotenone and allied substances 1·34	Hart and Co. Pty. Ltd., 84 Whiteman-street, South Melbourne
Kymac	Arsenic (As_2O_3) 12·20; Tar Acids 13·00	Younghusband Ltd., 94 King-street, Melbourne
Little's Liquid		Wilcox Mofflin Ltd., 499 Little Collins-street, Melbourne
" Fluid	" " 19·00	" " " " "
Quibell's Liquid	" " 18·00	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
Vallo Fluid	Tar Acids 18·00	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Young's Red Label Paste	Phenols 24·00; Tuba-toxins, &c. 19·50; Arsenic (As_2O_3) 15·00	Strachan and Co. Ltd., Geelong
Osmond's Ivory Fluid	Phenols 18·00	Osmond and Son (Aust.) Ltd., 35 William-street, Melbourne
Edward's Improved Fluid	Tar Acids 18·00	Primary Producers' Chemicals Pty. Ltd., 430 Little Collins-street, Melbourne
Sickle Double Action	Arsenic (As_2O_3) 21·00; Rotenone, &c. ·70	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Hart's Immunol Paste	Arsenic (As_2O_3) 41·80; Derris Ext. 4·60; Cresols 58·00; Rotenone and allied substances 1·34	Hart and Co. Pty. Ltd., 84 Whiteman-street, South Melbourne
Kymac		Elder Smith and Co. Ltd., Box 89, Geelong
Cooper's Pulvex	Rotenone and allied substances 2·50	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Quibell's Special Powder	Arsenic (As_2O_3) 21·60; Rotenone and allied substances ·70	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
Little's Supreme Powder	Arsenic (As_2O_3) 19·50; Rotenone and allied substances ·70	Wilcox Mofflin Ltd., 499 Little Collins-street, Melbourne
Vallo Dual Purpose	Arsenic (As_2O_3) 23·00; Rotenone and allied substances ·70	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Hart's Immunol Jetol	Arsenic (As_2O_3) 24·5; Cresol 33·4; Derris Oleo-resin ·82	Hart and Co. Pty. Ltd., 38 Clarendon-street South Melbourne
Hart's Immunol Cresol Arsenical Fluid	Arsenic (As_2O_3) 20·00; Cresol 20·0	" " " " "
Tyk-Dyp	Arsenic (As_2O_3) 25·00; Sulphur 70·00; Rotenone ·70	Permewan Wright Ltd., 31 King-street, Melbourne
K.S.D.	Arsenic (As_2O_3) 20·00; Cresylic Acid 25·00	K.S.D. Products, 229 Pt. Nepean-road, Gardenvale
Shorthouse's	Arsenic (As_2O_3) 17·00; Cresylic Acid 18·5; Phenol Homologues 45·00; Chlorinated Hydrocarbons 10·00; Pine Oil 12·00; Derris Oleo-Resin 2·00	A. H. Shorthouse, 4 Canning-street, Carlton
Lanoleen Derris		The Grazier's Co.-op. Shearing Co. Ltd., 90–92 William-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Weed Destroyer.	Percentage of Declared Active Ingredients.		Manufacturer or Wholesale Dealer.
Weed Destroyers (Non-poisonous).		%	
X.L. Sodium Chlorate	Sodium Chlorate	99·5	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Felton's Sodium Chlorate	Sodium Chlorate	99·0	Felton Grimade and Duerdins Ltd., 342–6 Flinders-lane, Melbourne
Faulding's Sodium Chlorate	Sodium Chlorate	99·0	F. H. Faulding and Co. Ltd., 123–25 Lonsdale-street, Melbourne
Pannifex 16/16 Lawn, No. 32	Ammonia	16·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
	Potash	16·0	
Atlacide Dusting Powder	Chlorate (ClO_3)	31·4	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
	Chloride (Cl)	13·4	
	Calcium	7·3	
	Sodium	8·7	
Atlacide	Chlorate (ClO_3)	44·85	" " " "
	Chloride (Cl)	19·15	
	Calcium	10·42	
	Sodium	12·46	
Weed Destroyers (Poisonous).		%	
Avery's	Arsenic (As_4)	60·6	Avery's Garden Insecticide Co., 67 Burnley-street, Richmond
Bell's Dandy Blue Weed Killer	" "	55·0	Rocke, Tompsitt, and Co. Pty. Ltd., 292–298 Flinders-street, Melbourne
Cooper's Weedicide*	" "	27·0	Ramsay and Treganowan Ltd., 469–477 Latrobe-street, Melbourne
Edwards*	" "	20·0	Primary Producers Chemicals Pty. Ltd., 430 Little Collins-street, Melbourne
Globe	" "	59·0	Rocke, Tompsitt, and Co. Pty. Ltd., 292–298 Flinders-street, Melbourne
" Weed and Scrub*	" "	21·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Vallo Weed, Scrub, and Tree	" "	60·6	
" Arzeen	" "	60·6	" " " " "
" Liquid Arzeen*	" "	36·3	" " " " "
" " Pentoxide*	" "	23·5	
Hardy's Weed Killer*	" "	20·0	Hardy's Weed Killer Pty. Ltd., 422 Collins-street, Melbourne
Pannifex Arsenical, No. 33	" "	20·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Tip Top	" "	60·6	Law Somner Pty. Ltd., 21–23 Elizabeth-street Melbourne
Hart's Soluble Arsenic Liquid	" "	36·3	Hart and Co. Pty. Ltd., 86 Whiteman-street-South Melbourne
" " " Powder	" "	60·6	" " " " "
" Pento Liquid	" "	23·5	
Faulding's Arsenical	" "	50·0	F. H. Faulding and Co. Ltd., 123 Lonsdale-street, Melbourne

* In liquid form.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

Burnley Egg-Laying Competition, 1939-40—Prize List

SECTION A.—TEAMS OF SIX BIRDS—TRAP-NESTED.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE, ALSO SECOND PRIZE—BURNLEY SASH.				
3	F. W. Becker, Follett-road, Cheltenham, S.22	1,634	2	1,632
EQUAL SECOND PRIZE—GOVERNMENT CERTIFICATE.				
7	C. Gowers, 52 Argyle-avenue, Chelsea	1,330	34	1,296
EQUAL SECOND PRIZE—GOVERNMENT CERTIFICATE,				
26	L. Magnusson, Private Bag, Nathalia	1,296	..	1,296
Class 2.—White Leghorns—Dry Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE; ALSO THIRD PRIZE—BURNLEY SASH.				
27	F. W. Becker, Follett-road, Cheltenham, S.22	1,530	4	1,526
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
28	C. R. Fagg, 76 Maud-street, Geelong	1,239	2	1,237
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
38	W. P. de Hugard, 33 Simpson's-road, Box Hill	1,235	..	1,235
Class 4.—Australorps—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE, BURNLEY CHAMPION SASH, ALSO SPECIAL CERTIFICATE FOR EXCEEDING BURNLEY RECORD FOR TWELVE MONTHS				
55	J. Herbert, 13 Dunn-street, Wonthaggi	1,666	1	1,665
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
66	W. A. Shevill, 35 Bourke-street, Mentone, S.11	1,333	1	1,332
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
67	W. A. Shevill, 35 Bourke-street, Mentone,	1,334	3	1,331
Class 5.—Rhode Island Reds—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
41	S. N. Lloyd, Box 21, Frankston	1,289	44	1,245
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
45	J. Rankin, 14 Freeman-street, Balwyn, E.8	1,192	..	1,192
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
47	J. Chatts, White-street, Beaumaris, S.10	1,130	4	1,126

SECTION B.—INDIVIDUAL BIRDS, SINGLE TEST

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
35	H. Lyon, 33 Clara-street, Preston, N.18	277	2	275
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
74	Trewin and Graham, Ardmona	272	..	272
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
77	J. H. Wernli, Wilson-street, Cheltenham, S.22	265	..	265
Class 2.—White Leghorns—Dry Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE, ALSO BURNLEY CHAMPION SASH.				
216	D. Granter, 163 Martin-street, Gardenvale, S.4	310	..	310
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
201	L. F. Werrett, 60 Yerrin-street, Balwyn, E.8	276	..	276
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
202	L. F. Werrett, 60 Yerrin-street, Balwyn, E.8	267	..	267
Class 4.—Australorps—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE, ALSO SECOND PRIZE—BURNLEY SASH.				
103	J. Chatts, White-street, Beaumaris, S.10	295	..	295
SECOND PRIZE—GOVERNMENT CERTIFICATE; ALSO THIRD PRIZE—BURNLEY SASH.				
99	Aitken and Grenville, Silver-street, Cheltenham, S.22	286	..	286
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
145	D. and J. Tresise, Serpentine	271	..	271
Class 5.—Rhode Islands—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
174	L. Snibson, East Boundary-road, Bentleigh, S.E.15 (Rhode Island Red)	286	7	279
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
161	H. Chalmers, Lefevre-street, Spotswood, W.14 (Rhode Island Red)	257	..	257
THIRD PRIZE—GOVERNMENT CERTIFICATE.				
191	G. Winter, "Denehurst," Murgheboluc, (R. I. Red)	234	..	234

PRIZE LIST—*continued.*

SECTION B.—INDIVIDUAL BIRDS, SINGLE TEST.
—continued.

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
Class 5.—All Heavy Breeds other than Australorps and Rhode Islands—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
228	D. Granter, 163 Martin-street, Gardenvale, S.4 (White Wyandotte)	257	..	257
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
230	J. Granter, 163 Martin-street, Gardenvale, S.4 (White Wyandotte)	256	..	256

YOUNG FARMERS' CLUB SECTION.

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
154	Verna Graham, Coimadai Young Farmers' Club, Coimadai	231	..	231
Class 2.—Australorps—Wet Mash.				
FIRST PRIZE—CHAMPION CERTIFICATE.				
158	Flora Rhodes, Mickleham Young Farmers' Club, Yuroke P.O., via Broadmeadows	240	..	240
SECOND PRIZE—GOVERNMENT CERTIFICATE.				
160	Marjorie Parker, Mickleham Young Farmers' Club, Mickleham P.O.	227	..	227

SECTION A.—FOR THE GREATEST NUMBER OF FIRST GRADE EGGS LAID BY INDIVIDUAL BIRDS IN EACH CLASS OF SECTION A.

Pen No.	Name and Address.	Bird No.	Total Eggs.	Underweight.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.					
FIRST PRIZE—CHAMPION CERTIFICATE.					
3	F. W. Becker, Follett-road, Cheltenham, S.22	15	290	..	290
SECOND PRIZE—GOVERNMENT CERTIFICATE.					
3	F. W. Becker, Follett-road, Cheltenham, S.22	18	282	..	282
THIRD PRIZE—GOVERNMENT CERTIFICATE.					
3	F. W. Becker, Follett-road, Cheltenham, S.22	13	279	..	279

Section A.—First Grade Eggs by Individual Birds—*continued.*

Pen No.	Name and Address.	Bird No.	Total Eggs.	Underweight.	First Grade Eggs.
Class 2.—White Leghorns—Dry Mash.					
FIRST PRIZE—GOVERNMENT CERTIFICATE.					
27	F. W. Becker, Follett-road, Cheltenham, S.22	162	270	..	270
SECOND PRIZE—GOVERNMENT CERTIFICATE.					
27	F. W. Becker, Follett-road, Cheltenham, S.22	158	267	..	267
THIRD PRIZE—GOVERNMENT CERTIFICATE.					
27	F. W. Becker, Follett-road, Cheltenham, S.22	160	269	4	265
Class 4.—Australorps—Wet Mash.					
FIRST PRIZE—CHAMPION CERTIFICATE.					
55	J. Herbert, 13 Dunn-street, Wonthaggi	329	304	1	303
SECOND PRIZE—GOVERNMENT CERTIFICATE.					
55	J. Herbert, 13 Dunn-street, Wonthaggi	326	293	..	293
THIRD PRIZE—GOVERNMENT CERTIFICATE.					
55	J. Herbert, 13 Dunn-street, Wonthaggi	327	284	..	284
Class 5.—Rhode Islands—Wet Mash.					
FIRST PRIZE—CHAMPION CERTIFICATE.					
41	S. N. Lloyd, Box 21, Frankston	242	255	..	255
SECOND PRIZE—GOVERNMENT CERTIFICATE.					
41	S. N. Lloyd, Box 21, Frankston	244	237	..	237
THIRD PRIZE—GOVERNMENT CERTIFICATE.					
48	S. N. Lloyd, Box 21, Frankston	283	236	..	236

SECTION A.—FIRST CLASS CERTIFICATES OF MERIT TO TEAMS IN CLASSES 1, 2, AND 4, WHICH LAID 1,200 FIRST GRADE EGGS, AND IN CLASS 5, WHICH LAID 1,000 FIRST GRADE EGGS.

Pen No.	Name and Address.	First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.		
11	C. and D. McLauchlan, 144 Through-road, Burwood, E.13	1,253
14	T. A. Pettigrove, 159 Hawdon-street, Heidelberg N.22	1,243
8	H. I. Jolly, Nelson-road, Trafalgar ...	1,233
21	T. A. Welch, 10 Hayes-road, North Essendon, W.6	1,227
18	J. A. Stewart, Maldon-road, Castlemaine	1,211
9	S. N. Lloyd, Box 21, Frankston ..	1,207

Prize Lists.—*continued*

Section A.—*continued.*

Pen No.	Name and Address.	First Grade Eggs.
	Class 4.—Australorps—Wet Mash.	
58	K. McKenzie, 82 Clarence-street, Geelong West	1,288
69	D. and J. Tresise, Serpentine	1,243
70	Wimbledon Poultry Farm (J. Mooney), 46 Grandview-street, Glenroy, W.9	1,236
54	C. H. Harvey, Pakenham South ..	1,223
	Class 5.—Rhode Island Reds—Wet Mash.	
48	S. N. Lloyd, Box 21, Frankston ..	1,077
40	H. Dibbs, 3 Balfe-crescent, West Brunswick, N.12	1,059
43	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	1,037

FIRST CLASS CERTIFICATES OF MERIT TO INDIVIDUAL BIRDS IN CLASSES 1, 2, AND 4, WHICH LAID 220 FIRST GRADE EGGS, AND IN CLASS 5, WHICH LAID 200 FIRST GRADE EGGS.

Section A.—*continued.*

Pen No.	Name and Address.	Bird No.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.		
4	C. R. Fagg, 76 Maud-street, Geelong	19	224
5	W. Ford and P. Moir, 22 Riverview-terrace, Belmont, via Geelong	26	228
	,, ,, ,, ,,	28	256
6	J. Fraser, 19 Collins-street, Bentleigh, S.E.14	31	246
	,, ,, ,, ,,	32	229
8	H. I. Jolly, Nelson-road, Trafalgar	45	258
	,, ,, ,, ,,	46	220
9	S. N. Lloyd, Box 21, Frankston ..	50	255
	,, ,, ,, ,, ..	52	221
	,, ,, ,, ,, ..	53	233
10	K. McKenzie, 82 Clarence-street, Geelong West	57	230
11	C. and D. McLauchlan, 144 Through-road, Burwood E.13	61	243
	,, ,, ,, ,,	62	232
	,, ,, ,, ,,	63	224
	,, ,, ,, ,,	64	248
14	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	82	251
17	Squirrell Bros., Tulip-street, Cheltenham, S.22	98	236
	,, ,, ,, ,,	101	239
18	J. A. Stewart, Maldon-road, Castlemaine	104	241
	,, ,, ,, ,,	108	224
21	T. A. Welch, 10 Hayes-road, North Essendon, W.6	121	242
	,, ,, ,, ,,	122	222
	,, ,, ,, ,,	126	252
23	Sorrento Farm, Campbell-road, Sorrento	133	240
	,, ,, ,, ,,	136	229
	,, ,, ,, ,,	138	220

Section A.—*continued.*

Pen No.	Name and Address.	Bird No.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash—*continued.*		
25	A. and W. Millington, Murray-street, Fawkner, N.15	147	227
3	F. W. Becker, Follett-road, Cheltenham, S.22	14	277
	,, ,, ,, ,,	16	252
	,, ,, ,, ,,	17	252
7	C. Gowers, 52 Argyle-avenue, Chelsea	38	229
	,, ,, ,, ,,	40	239
26	L. Magnusson, Private Bag, Nathalia	152	237
	,, ,, ,, ,,	155	225
	Class 2.—White Leghorns—Dry Mash.		
27	F. W. Becker, Follett-road, Cheltenham, S.22	157	236
	,, ,, ,, ,,	158	235
	,, ,, ,, ,,	161	250
28	C. R. Fagg, 76 Maud-street, Geelong	164	226
	,, ,, ,, ,,	167	224
38	W. P. de Hugard, 33 Simpson's-road, Box Hill, E.11	223	224
	,, ,, ,, ,,	227	235
29	S. N. Lloyd, Box 21, Frankston ..	170	234
30	C. and D. McLauchlan, 144 Through-road, Burwood, E.13	176	240
	,, ,, ,, ,,	178	239
31	A. and W. Millingtom, Murray-street, Fawkner, N.15	181	247
	,, ,, ,, ,,	182	249
	,, ,, ,, ,,	183	232
33	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	193	222
35	J. M. Sutherland, Fulton-road, Box Hill	209	229
36	Sorrento Farm, Campbell-road, Sorrento	211	244
	Class 4.—Australorps—Wet Mash.		
55	J. Herbert, Dunn-street, Wonthaggi	325	246
	,, ,, ,, ,,	328	281
	,, ,, ,, ,,	330	258
66	W. A. Shevill, 35 Bourke-street, Mentone, S.11	391	239
	,, ,, ,, ,,	392	234
	,, ,, ,, ,,	394	230
	,, ,, ,, ,,	396	232
67	,, ,, ,, ,,	397	224
	,, ,, ,, ,,	398	240
	,, ,, ,, ,,	399	225
	,, ,, ,, ,,	402	251
52	Aitken and Grenville, Silver-street, Cheltenham, S.22	308	274
53	C. E. Graham, Portarlington ..	314	234
54	C. H. Harvey, Pakenham South ..	321	224
56	Mrs. S. A. Kelly, 214 Pascoe Vale-road, Pascoe Vale, W.8	333	225
58	K. McKenzie, 82 Clarence-street, Geelong West	243	233
	,, ,, ,, ,,	248	224
60	A. C. Moran, 48 Marina-road, Mentone, S.11	359	227

PRIZE LIST—*continued.*

Section A—*continued.*

Pen No.	Name and Address.	Bird No.	First Grade Eggs.
	Class 4.—Australorps—Wet Mash—*continued.*		
62	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	367	242
	" " " "	368	236
63	G. W. E. Scott, 16 Latrobe-street, Mentone, S.11	373	231
	" " " "	374	231
64	E. J. Shapland, Braeside ..	379	226
69	D. and J. Tresise, Serpentine ..	409	221
	" " " "	410	229
	" " " "	411	227
70	Wimbledon Poultry Farm (J. Mooney) 46 Grandview-street, Glenroy, W.9	415	233
	" " " "	417	223
	" " " "	419	232
	Class 5.—Rhode Islands Reds—Wet Mash.		
41	S. N. Lloyd, Box 21, Frankston ..	245	210
	" " " " ..	246	217
45	J. Rankin, 14 Freeman-street, Balwyn, E.8	266	210
	" " " "	268	210
47	J. Chatts, White-street, Beaumaris, S.10	278	218
	" " " "	281	228
40	H. Dibbs, 3 Balfe-crescent, West Brunswick, N.12	236	201
	" " " "	240	220
43	Tedstone and Rankin, 243 Whitehorse-road, Balwyn, E.8	253	213
	" " " "	254	202
46	Pine View Poultry Farm (R. Willmott), 3 Monteath-avenue, Hawthorn East, E.3	272	217
48	S. N. Lloyd, Box 21, Frankston ..	284	226
	" " " " ..	285	201
	" " " " ..	286	202

SECTION B.—FIRST CLASS CERTIFICATES OF MERIT TO HENS IN CLASSES 1, 2, AND 4, WHICH LAID 240 FIRST GRADE EGGS, AND IN CLASSES 3 AND 5, WHICH LAID 220 FIRST GRADE EGGS.

Pen No.	Name and Address.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.	
1	E. Abikhair, 41 Wilfred-road, Ivanhoe ..	264
4	Aitken and Grenville, Silver-street, Cheltenham, S.22	240
5	All Varieties Poultry Farm (Mickelburough Bros.), Herald-street, Cheltenham, S.22	256
6	" " " "	249
9	T. Birchall, 180 Harold-street, Thornbury, N.17	250

Section B.—*continued.*

Pen No.	Name and Address.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash—*continued.*	
14	W. Clingen, Hunt-street, Doncaster East, P.O.	247
17	W. B. Corker, Bruthen	260
19	A. T. Dent, Edward-street, Greensborough	245
22	T. L. Eastaugh, Point Nepean-road, Highett, S.21	260
26	H. D. Evans, Web's Store, Pumps-road, Red Cliffs	256
27	A. Hewett, Central-avenue, Bayswater ..	253
53	F. T. Moore, 152 Nimmo-street, Essendon, W.5	244
55	Oldham Poultry Farm (J. and F. M. Lees), 491 Middleborough-road, Box Hill, E.12	244
59	T. A. Pettigrove, 159 Hawdon-street, Heidelberg, N.22	250
62	P. Phelan, 11 Traill-street, Northcote, N.16	247
83	A. and W. Millington, Murray-street, Fawkner, N.15	254
86	A. R. Davey, Edward-street, Greensborough	247
91	L. Magnusson, Private Bag, Nathalia ..	244
	Class 2.—White Leghorns—Dry Mash.	
205	"Lawn Garrard," (C. A. L. Garrard), 48 Cooper-street, West Preston, N.18	248
209	M. G. Skinner, 75 Vincent-street, Sandringham, S.8	245
215	D. Granter, 163 Martin-street, Gardenvale, S.4	262
221	A. Siede and Sons, Point Nepean-road, Highett, S.21	244
223	M. G. Skinner, 75 Vincent-street, Sandringham, S.8	255
224	" " " " "	251
	Class 4.—Australorps—Wet Mash.	
97	E. Abikhair, 41 Wilfred-road, Ivanhoe ..	248
98	" " " " "	259
104	J. Chatts, White-street, Beaumaris, S.10 ..	263
109	J. T. Cornish, Healesville	262
120	J. Grass, 44 Station-street, Burwood, E.13	245
127	C. H. Harvey, Pakenham South ..	251
128	" " " ..	262
129	K. McKenzie, 82 Clarence-street, Geelong West	249
137	P. Phelan, 11 Traill-street, Northcote, N.16	240
145	D. and J. Tresise, Serpentine	271

Australorps entered by J. Herbert, 13 Dunn-street, Wonthaggi, were bred by W. J. Macauley.

Brown Leghorns entered by Jock Granter, 163 Martin-street, Gardenvale, were bred by Don Granter.

Australorps entered by R. A. Wilson, Duncan's-road, Werribee, were bred by W. Cullen.

The White Leghorn entered by D. Granter was bred by F. W. Becker.

PRIZE LIST—*continued.*

FOR INDIVIDUAL BIRDS, IN BOTH SECTIONS A AND B, THAT LAID THE GREATEST WEIGHT OF EGGS.

Pen No.	Name and Address.	Bird No.	Total of all Eggs.	Weight of Eggs.

SECTION B.— INDIVIDUAL BIRDS—SINGLE TEST.

Class 2.—White Leghorns—Dry Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

216	D. Granter, 163 Martin-street, Gardenvale, S.4	216	310	688·6 oz. (43 lb. 0·6 oz.)

Class 4.—Australorps—Wet Mash.

SECOND PRIZE—GOVERNMENT CERTIFICATE.

103	J. Chatts, White-street, Beaumaris, S.10	103	295	671·2 oz. (41 lb. 15·2 oz.)

SECTION A.—TEAMS OF SIX BIRDS, TRAP-NESTED.

Pen No.	Name and Address.	Bird No.	Total of all Eggs.	Weight of Eggs.

Class 4.—Australorps—Wet Mash.

THIRD PRIZE—GOVERNMENT CERTIFICATE.

55	J. Herbert, 13 Dunn-street, Wonthaggi	326	293	641 oz. (40 lb. 1 oz.)

The number of eggs shown above was the total number laid by each of these birds, and were all first-grade.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	190	13	Gorman, A. W. ..	"Cathcart," Alexandra	63
2	Warragul High School	Warragul ..	45				
3	Payne, A. E. T. ..	"Yarra View," Lilydale	66	14	Samuel, B. T. ..	Lang Lang ..	72
4	Dennis, Mrs. A. A. ..	Frankston ..	19	15	Powell T. S. ..	"Carellen," Mansfield	48
5	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	87	16	Dunbar & Clark, Messrs.	"Hazeldean Dairy" Mount Dandenong	16
6	School of Horticulture	Burnley ..	6				
7	Lawrence, P. H. ..	"Rainga," Tarrawarra	60				
8	Banyule Stud Pty. Ltd.	Heidelberg ..	57	17	Richardson Bros., Messrs.	"Faldinghurst" Upper Beaconsfield	27
9	Black, Mrs. Agnes ..	Mount Noorat	34				
10	Black, Estate, Late I. S.	"The Cottage," Mount Noorat	44	18	Onley, W. H.	"Glenholme" Caldermeade	52
11	Read, John D. ..	"Springhurst Estate," Springhurst	112	19	Payne, T. E. N.	"Woodburn" Kilmore	57
12	Kelly, C. ..	"Glenmore," Creighton's Creek, Euroa	17	20	Holloway, R. W.	Caldermeade..	54

T. RIDER, Government Printer, Melbourne.

DEPARTMENT OF AGRICULTURE

VICTORIA, AUSTRALIA

LIST OF STOCK FOODS AND STOCK LICKS

For 1940

STANDARD HERD RECORDS

For Quarter Ending 31st March, 1940

Supplement to the *Journal of Agriculture, Victoria*, June, 1940.

5844/40.

List of Stock Foods and Stock Licks

Registered at the Office of the Director of Agriculture under the Stock Foods Act 1936, No. 4382, for the Year 1940.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum	Crude Fat. Minimum	Crude Fibre. Maximum	
	%	%	%	
CONCENTRATED STOCK FOODS.				
Dried Blood Meal.				
M.C.C. Blood Meal	72·0	1·0	5·0	Melbourne City Council, Town Hall, Melbourne
Imperial Blood	75·0	..	5·0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-street, Melbourne
Brooklyn, T.B. and S. in diamond	75·0	..	5·0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-street, Melbourne
Clark's	65·0	..	5·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Champion	75·0	..	5·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Meat Meal.				
M.C.C. Meat Meal	63·0	10·0	5·0	Melbourne City Council, Town Hall, Melbourne
M.C.C. (with bone)	57·0	10·0	5·00	Melbourne City Council, Town Hall, Melbourne
T.B. and S. in Diamond Brooklyn Meat Meal	53·0	12·0	4·0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William street, Melbourne
Cal-phoric Meat Meal	52·0	12·0	1·0	Mulgrave By-Products Co., North-road, East Oakleigh
Apex Meat Meal	53·0	7·2	2·0	North-Eastern Bone Products, Wangaratta
Champion Meat Meal	50·0	12·0	2·0	Sims Cooper (Freezing Works) Pty. Ltd., 499 Little Collins-street, Melbourne
Cockbill's Meat Meal	48·0	12·0	3·0	W. and J. Cockbill, Footscray-road, Footscray
Dandy Meat Meal	50·0	12·0	1·5	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
Apollo Meat Meal	45·0	8·0	1·0	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
J.K.S.	45·0	10·0	2·00	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
Pridham's Meat Meal	53·00	12·00	1·0	W. Pridham Pty. Ltd., Evans-street, Braybrook
Imperial Meat Meal	60·00	9·00	2·0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-street, Melbourne
Imperial Liver Meal	65·00	18·00	..	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-street, Melbourne
Imperial Bovina	48·0	8·0	1·00	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-street, Melbourne
Excelsior Meat Extract Meal	40·00	10·00	..	Rowcroft Bros., 123 William-street, Melbourne
Arch No. 1	45·0	12·0	2·0	Amalgamated Freezing Co. (Vic.) Pty. Ltd., 54 Market-street, Melbourne
Clark's Vitabeef	52·0	12·0	2·00	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Mercury	55·0	12·0	1·00	H. C. Sleigh, 582 Little Collins-street, Melbourne
Bovaline	68·0	5·0	4·00	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Pannifex "Best"	40·0	8·0	3·00	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Pannifex Special	50·0	5·0	3·00	Pannifex & Co. Pty. Ltd., 4 Dudley-street, Melbourne
Badale	68·0	10·0	2·3	Bairnsdale By-Products Pty. Ltd., 440 Little Collins-street, Melbourne
PREPARED STOCK FOODS.				
Milk Products.				
Krafco	10·0	0·5	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Kraftone	10·0	0·5	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Clark's Rising Sun Buttermilk Powder	35·0	5·0	..	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Maffco	30·0	5·0	..	Maffra Co-op. Milk Products Co. Ltd., Maffra
K.B.F.	30·0	6·0	..	Korumburra and District Co.-op. Butter Factory and Trading Co. Ltd., Korumburra
Allansford	30·3	7·0	..	Warrnambool Cheese and Butter Factory Co. Ltd., Allansford
Clark's Vitamilk	31·0	6·0	1·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Lacfos	14·0	0·5	..	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Longbar Whey Powder	11·0	0·5	..	Alfred Barrow Pty. Ltd., 47 King-street, Melbourne

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4382, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum	Crude Fat. Minimum	Crude Fibre. Maximum	
PREPARED STOCK FOOD—*continued.* *Oil-Seed or Cake Meals and Nuts.*	%	%	%	
Eta Peanut Meal	48·0	1·5	6·0	Nut Foods Pty. Ltd., 271–277 Grant-street, South Melbourne
Linseed Meal	18·0	30·0	9·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Meggitt's Linseed Oil-cake Meal	28·0	6·0	10·0	Meggitt Ltd., Hobson's-road, South Kensington
Meggitt's Linseed Sheep Nuts	28·0	6·0	10·0	Meggitt Ltd., Hobson's-road, South Kensington
Sunlight Oil-cake	20·0	5·5	6·5	Lever Bros. Pty. Ltd., 565 Flinders-lane, Melbourne
Key Meal	20·0	5·5	6·5	Lever Bros. Pty. Ltd., 565 Flinders-lane, Melbourne
Eta Cocoanut Meal	19·0	7·0	9·0	Nut Foods Pty. Ltd., 271–277 Grant-street, South Melbourne
Barnes Linseed Sheep Nuts	30·0	6·0	10·0	Robert Nelson and Co., 528 Collins-st., Melbourne
"Halmeg" Linseed Meal	31·7	2·8	13·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
"Halmeg" Sheep Nuts	28·4	2·6	13·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Meggitt's Balanced Linseed Sheep Nuts	18·0	4·0	6·0	Meggitt Ltd., Hobson's-road, South Kensington
Velvet Oil Cake Meal	20·0	5·5	6·5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
Velvet Oil Cake	20·0	5·5	6·5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
A.H.P. Sheep Nuts	24·0	6·0	10·0	New Zealand Loan and Mercantile Agency Co. Ltd., 538–544 Collins-street, Melbourne
MIXED STOCK FOODS.				
Osmond's Codlivine	19·0	12·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Osmond's Codlivine (Poultry)	19·0	12·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Osmond's Codlivine (Pigs)	20·0	12·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Harpers Star Calf Food	12·5	12·5	6·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parsons Calf Food	11·5	14·0	6·5	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Excello Calf Food	10·5	4·2	3·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Ayrshire Calf Food	13·35	2·49	3·14	James Ralston, 133 Elizabeth-street, Melbourne
Ward's Calf Food	9·0	3·0	7·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Vetamac Calf Food	20·23	13·13	5·75	A. H. McDonald, 568 Bridge-road, Richmond
White's Laying Mash	16·0	2·5	8·0	White, Hancock, and Mills Pty. Ltd., 296–306 City-road, South Melbourne
Ward's Chick Meal	10·0	4·0	5·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Excello Laying Mash	13·6	4·3	7·3	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Lyall's Werribee Mash	8·4	3·0	6·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Excello Growing Mash	9·0	3·4	7·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Barkla Growing Mash	11·5	3·5	3·8	R. E. Barkla, Joyce's Creek
White's Werribee Meal	13·0	4·0	3·0	White, Hancock and Mills Pty. Ltd., 296 City-road, South Melbourne
Protone "A"	10·5	10·0	11·0	Permewan Wright Ltd., 31 King-street, Melbourne
Protone "B"	12·7	12·1	8·0	Permewan Wright Ltd., 31 King-street, Melbourne
Presto Egg Producer	40·3	3·3	1·5	Nathan's Merchandise (Vic.) Pty. Ltd., 559 Lonsdale-street, Melbourne
Harper's Star Chick Flakes	10·0	9·0	5·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Star Chick Food	10·0	8·5	5·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Clark's Laymor	19·0	6·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Gro-chik	16·0	7·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Werribee Meal	13·0	4·0	5·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Eggoleen	40·0	12·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Chick-starter	16·0	7·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
White's Growing Mash	14·5	3·0	8·0	White, Hancock and Mills Pty. Ltd., 296 City-road, South Melbourne
Baird's Laying Mash	15·0	5·0	6·0	G. W. and H. P. Baird Pty. Ltd., 15–33 Queens-parade, Clifton Hill
Baird's Growing Mash	13·5	4·5	5·0	G. W. and H. P. Baird Pty. Ltd., 15–33 Queens-parade, Clifton Hill
Warragul Laying Mash	14·05	4·5	4·2	Warragul Egg Circle, Warragul

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4382, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum	Crude Fat. Minimum	Crude Fibre. Maximum	
MIXED STOCK FOODS—*continued.*	%	%	%	
Warragul Growing Mash	14·07	5·9	5·2	Warragul Egg Circle, Warragul
Vita-lick Pig Mixture (V.P.M.)*	13·2	1·8	3·2	Goldsbrough Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita-lick Mineral Mixture (V.M.M.)*	7·7	7·8	3·1	Goldsbrough Mort and Co. Ltd., 526 Bourke-street, Melbourne
Kaf-o-Vite	14·3	12·3	5·6	Goldsbrough Mort and Co. Ltd., 526 Bourke-street, Melbourne
Cole's Chick Food	15·84	2·98	5·23	H. J. Cole, Carlsbrook
Vita-Pro-Teen††	9·62	4·13	10·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Allkon "Protovite"	30·0	6·5	7·0	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Harper's Prepared Grain (Poultry)	9·0	9·0	4·50	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Mormilk "A"	31·7	2·8	13·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Mormilk "B"	32·0	3·5	10·5	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Mormilk "C"	34·0	4·0	8·0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Wilmo Stock Food	15·5	8·0	15·5	Wilcox Mofflin Ltd., Henty House, Little Collins-street, Melbourne
Cowling's Laying Mash	18·0	3·5	5·0	W. Cowling, Market Square, Bendigo
Cowling's Growing Grain	13·5	2·0	3·0	W. Cowling, Market Square, Bendigo
Cowling's Chick Mixture	12·0	1·25	2·5	W. Cowling, Market Square, Bendigo
Cowling's Werribee Mixture	12·0	3·50	5·0	W. Cowling, Market Square, Bendigo
Welco Codovite	30·0	6·5	7·0	Welch, Perrin and Co. Pty. Ltd., 48–56 Queenbridge-street, South Melbourne
Barastoc Ewe and Lamb Cubes	20·0	4·0	7·5	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Calf Pellets	18·0	4·0	6·5	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Dairy Cow Cubes	18·0	4·0	8·5	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Poultry Pellets W (Layers)	17·0	4·5	7·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Sheep Maintenance Cubes	14·5	3·5	8·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Pig Fattening Cubes	15·0	3·0	6·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Dairy Cow Meal	18·0	4·0	8·5	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Chick Pellets	18·0	5·0	6·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Poultry Grower's Pellets	15·0	4·5	7·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Poultry Breeding Pellets	15·5	4·5	7·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Poultry Pellets W (Growers)	15·0	4·5	7·0	Barastoc Products, 422 Collins-street, Melbourne
Barastoc Poultry Layers' Pellets	17·0	4·5	7·0	Barastoc Products, 422 Collins-street, Melbourne
Velox Calf Food	14·6	2·9	4·0	H. C. Allen, Portarlington
Clark's Calf Food	18·0	5·0	4·0	Clark, King and Co. Pty. Ltd., Queen-street, Melbourne
Taylor's National Calf Food	13·5	6·5	5·5	National Cattle and Poultry Food Co., 64A King-street, Melbourne
McB Laying Mash	14·1	4·5	4·2	McColl and Buzza Pty. Ltd., 865 Dandenong-road, Caulfield East
WHEAT AND WHEAT BY-PRODUCTS.				
McB Wheat Meal	12·3	3·0	3·6	McColl and Buzza Pty. Ltd., 865 Dandenong-road, Caulfield East
Lyall's Wheat Meal	9·0	3·0	4·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Wheat Meal	9·00	1·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Baird's Wheat Meal	10·90	2·3	2·5	G. W. and H. P. Baird Pty. Ltd., 15–33 Queens-parade, Clifton Hill
Pratts Ground Wheat	9·5	1·5	3·5	David Pratt and Sons, Mair-street, Ballarat
White's Wheat Meal	11·0	2·0	3·0	White, Hancock and Mills Pty. Ltd., 296 City-road, South Melbourne
Pro-Vita	29·5	10·0	2·5	Pro-Vita Mills (Aust.) Ltd., 422 Collins-street, Melbourne
BRAN AND POLLARD.				
The following firms have registered distinguishing brand names for Bran† and Pollard†:—				
Barwon Flour Mills	..	..	..	40 Little Malop-street, Geelong
Brunton and Co. Pty. Ltd.	..	..	..	531 Collins-street, Melbourne, and Rupanyup
Burnley Flour Mills Pty. Ltd.	..	..	..	376 Swan-street, Burnley
Burrows, John, Pty. Ltd.	..	..	..	Albury, New South Wales
Corowa Milling Co. Ltd.	..	..	..	Corowa, New South Wales
Darling (John) and Son	..	..	..	44 King-street, Melbourne
Echuca Flour Mills Pty. Ltd.	..	..	..	Echuca
Garden City Flour Milling Co. Pty. Ltd.	..	..	..	Trench-street, Ballarat
Grant and Wilson Pty. Ltd.	..	..	..	McNally-street, Yarrawonga
Kimpton (W. S.) and Sons	..	..	..	422 Collins-street, Melbourne
Malcolm (James) and Co. Pty. Ltd.	..	..	..	St. Arnaud

* Contains minerals—phosphates, &c.
†† Contains 17·15 per cent. salt.

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4332, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
BRAN AND POLLARD—*continued.*	%	%	%	
Maryborough Flour Mills Pty. Ltd...	..	..	..	Maryborough
McLennan and Co. Pty. Ltd. ..	..	..	..	Mooroopna
Miniffe (James) and Co.	..	..	..	422 Collins-street, Melbourne
Noske Bros. Pty. Ltd.	..	..	..	103 Queen-street, Melbourne, Horsham, Nhill and Charlton
Schutt and Barrie Pty. Ltd. ..	..	..	..	Geelong-road, West Footscray
Silver Lake Flour Milling Co. ..	..	..	..	Sale
Smith (W. and P.)	..	..	..	35 Cusack-street, Wangaratta
Stratton and Co. Pty. Ltd. ..	..	..	..	68 Lulie-street, Abbotsford
Sunraysia Flour Mills Pty. Ltd. ..	..	..	..	Mildura
The Tooronga Milling Co. Pty. Ltd.	..	..	..	463 Auburn-road, Hawthorn, Melbourne
Thomas (W. C.) and Sons Pty. Ltd.	..	..	..	55 William-street, Melbourne
Tomlins, Simmie and Co. Pty. Ltd.	..	..	..	Bendigo and Richmond
Wangaratta Flour Mills Co. Pty. Ltd.	..	..	..	Wangaratta and Wahgunyah
Willis Bros.	..	..	..	Kyneton
Wimmera Flour Mill Co. Pty. Ltd...	..	..	..	Stawell
Water and Kerang United Roller Mills Ltd.	..	..	..	83 William-street, Melbourne
Wise Bros.	..	..	..	Tocumwal
Jackett and Sons	..	..	..	534 Bridge-road, Richmond
Hudson and Co. Pty. Ltd. (Bran only)	..	..	..	631–5 Church-street, Richmond
Hutchinson's Finlay Flour Milling and Agency Co. Pty. Ltd.	..	..	..	Glenroy
† The 1940 Chemical Standard for Bran is	14·0	2·5	10·0	See footnote to this list.
‡ The 1940 Chemical Standard for Pollard is	14·0	3·0	6·25	See footnote to this list.
OAT PRODUCTS.				
Parson's No. 1 Oat Branning	10·00	6·75	16·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's No. 2 Oat Branning	7·50	5·75	15·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Harper's Star Oat Branning	8·0	6·5	25·00	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parson's No. 2 Oat Screenings ..	8·50	5·50	13·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's No. 3 Oat Screenings ..	7·00	5·00	21·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Fleming's Oat Branning	8·5	5·5	25·0	Fleming and Co. (Aust.) Ltd., 440 Little Collins-street, Melbourne
Ward's Oat Branning	6·00	4·00	25·00	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Connell's Oat Branning	11·30	8·50	14·00	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Connell's Oat Pollard	11·80	9·00	2·00	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Lyall's Oat Meal	10·0	7·00	7·00	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Oat Pollard	12·00	7·00	5·00	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
McKenzie's Oat Pollard	10·00	8·00	5·00	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
McKenzie's Oat Branning	7·00	4·00	20·00	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-stree North Melbourne
BARLEY PRODUCTS.				
Harper's Star Barley Meal	13·5	5·50	2·5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Ward's Barley Meal	10·0	4·00	10·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Lyall's Barley Meal	9·2	2·40	4·7	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Connell's Barley Meal	10·4	4·50	3·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Connell's Barley Branning	10·4	6·00	9·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Harper's Star Barley Branning ..	14·0	6·50	3·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parson's Barley and Oat Pollard ..	11·0	5·50	10·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Lyall's Barley and Oat Pollard ..	10·0	4·0	7·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Barley Pollard	12·0	3·00	20·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
Kelric Distillers Grains	18·0	4·0	17·0	K. B. Stock Food Pty. Ltd., Wellington-street, Collingwood
Pratt's Ground Barley	7·0	1·0	7·0	David Pratt and Sons, Mair-street, Ballarat

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4382, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum	Crude Fat. Minimum	Crude Fibre. Maximum	
	%	%	%	
RICE PRODUCTS.				
Harper's Rice Bran	5·0	6·0	40·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Star White Rice Meal	10·0	12·5	8·5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Star Brown Rice Meal	10·0	17·0	9·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parson's Rice Meal	10·0	19·0	9·5	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
McKenzie's Rice Pollard	10·0	15·0	8·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
MAIZE PRODUCTS.				
Polly Gluten Feed	23·0	3·0	9·0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Ward's Maize Meal	7·0	3·0	4·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Lyall's Maize Meal	8·0	3·0	2·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Maize Oil Meal	16·0	12·0	10·0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Parson's Wet Maize Bran	3·0	1·0	2·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Clark's Maize Meal	7·0	3·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
White's Maize Meal	7·0	3·0	3·0	White, Hancock and Mills Pty. Ltd., 296 City-road, South Melbourne
Pratt's Ground Maize	7·0	2·0	3·5	David Pratt and Sons, Mair-street, Ballarat
McB. Maize Meal	8·3	4·3	3·5	McColl and Buzza Pty. Ltd., 865 Dandenong-road, Caulfield East
PEA PRODUCTS.				
Parson's Pea Meal	16·00	1·50	18·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Pea Meal	14·00	1·00	18·00	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Harper's Whole Pea Screenings	18·5	1·00	5·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Split Pea Screenings	15·00	1·00	5·00	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parsons Pea Screenings	16·25	1·00	6·00	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Clark's Pea Meal	18·00	1·00	15·00	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
McKenzie's Pea Pollard	20·0	1·00	10·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
HULLS.				
Parson's Barley Hulls	2·50	·60	39·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
McKenzie's Pea Hulls	6·00	·50	40·00	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
Parson's Pea Hulls	3·50	·40	46·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's Oat Hulls (A)	1·25	·40	40·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's Oat Hulls (B)	4·25	3·00	30·00	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's Oat Hulls (C)	5·00	1·25	34·00	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Barley Hulls	2·00	·80	32·00	H. S. K. Ward Pty. Ltd., 24–38 Spencer street, Melbourne
Ward's Pea Hulls	5·00	·25	40·00	H. S. K. Ward Pty. Ltd., 24–38 Spencer street, Melbourne
Ward's Oat Hulls	1·50	·70	35·00	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Connell's Barley Hulls	5·00	·25	18·00	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Connell's Oat Hulls	·50	·50	35·00	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Fleming's Oat Hulls	2·0	1·0	32·5	Fleming and Co. (Aust.) Ltd., 440 Little Collins-street, Melbourne
Harper's Oat Hulls	1·75	·75	35·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
McKenzie's Oat Hulls	1·50	1·00	35·00	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
MISCELLANEOUS.				
Lucerne Meal	13·0	3·0	25·00	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Seed Meal	41·93	4·28	12·64	A. L. Thompson Pty. Ltd., 49–65 Grant-street, South Melbourne
Bakehouse Sweepings	2·0	2·0	2·0	Swallow and Ariel Ltd., 60 Stokes-street, Port Melbourne
Biscuit Sweepings	2·0	2·0	2·0	Swallow and Ariel Ltd., 60 Stokes-street, Port Melbourne

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4382, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron. (as Fe_2O_3).	Sulphur.	Iodine.	
	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
STOCK LICKS.								
Common Salt.								
"Lepp" Salt Lick	100·0	..	..	..	..	..	..	J. S. Corden and Co. (Vic.) Pty. Ltd., 44–54 Spencer-street, Melbourne
Ram Salt Lick, 100 per cent. ..	100·0	..	..	..	..	..	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
C.F.C. Stock Salt, 100 per cent.	100·0	..	..	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Ram-Lic	97·0	..	..	..	..	3·0	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Vetamac Salt Lick	97·0	..	..	..	..	3·0	..	A. H. McDonald and Co. Pty. Ltd., 568 Bridge-road, Richmond
Vetamac Salt Lick (Iodised) ..	99·0	..	..	..	0·1	..	Trace	A. H. McDonald and Co. Pty. Ltd., 568 Bridge-road, Richmond
Bone Meal, &c.								
Cockbill's Bone Meal	..	21·76	27·60	..	..	..	..	W. and J. Cockbill, Footscray-road, Footscray
Apex Sterilized Bone Meal ..	..	24·0	28·0	..	..	..	..	North Eastern Bone Products, Wangaratta
Nuclife Bone Meal	..	24·50	32·00	..	..	..	..	E. F. Peters and Sons Pty. Ltd., Dunolly
Tricalos Sterilized Bone Flour ..	..	32.5	40·0	..	..	..	..	Glues and By-Products Pty. Ltd. 86 King-street, Melbourne
Cockbill's Bone Grit	..	20·00	25·27	..	..	..	..	W. and J. Cockbill, Footscray-road, Footscray
Clark's Bone Meal	..	21·00	46·0	..	..	..	..	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Champion Bone Meal ..	..	21·00	30·0	..	..	..	..	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-street, Melbourne
Imperial Bone Flour	..	27·0	32·0	..	..	..	..	W. Angliss and Co. (Aust.) Pty. Ltd., Bourke-street, Melbourne
M.B.P. Bone Meal	..	24·5	31·3	..	..	..	..	Murray By-Products Pty. Ltd., 422 Collins-street, Melbourne
Miscellaneous.								
C.F.C. Di-Calcic Phosphate ..	..	37·50	29·57	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Di-Calcic Lick, No. 1 ..	65·00	9·38	7·39	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Di-Calcic Lick, No. 2 ..	71·00	5·63	4·44	·49	·29	5·00	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Di-Calcic Lick, No. 2 (with Iodine)	71·00	5·63	4·44	·49	·29	5·00	·05	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Di-Calcic Concentrate, No. 3	..	23·44	18·48	2·03	1·20	20·83	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Di-Calcic Concentrate, No. 3 (with Iodine)	..	23·44	18·48	2·03	1·20	20·83	·19	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Bone Lick (with Iodine)..	61·00	6·53	8·28	·49	·29	5·00	·05	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
C.F.C. Ground Phosphate ..	..	36·65	49·50	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Vic-Lic Sheep Lick D ..	..	28·77	30·57	..	4·28	..	·03	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
Vic-Lic Sheep Lick G ..	..	29·02	31·10	..	7·37	..	·03	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
Vigoreen Concentrate ..	15·00	11·00	16·80	1·95	1·50	6·00	·09	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Osmond's Mineral Concentrate	..	27·0	30·0	8·35	·7	..	·03	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Osmond's Toneca Stock Lick ..	70·0	7·0	10·50	7.15	·25	2·0	·03	Osmond and Sons (Aust.) Pty. Ltd.. 35 William-street, Melbourne
Salvitis Lick No. 1	90·0	1·8	2·50	·2	·8	·4	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Salvitis Concentrate No. 1 ..	..	18·8	25·00	2·0	8·4	4·4	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
C-Lik	22·0	8·00	20·00	4·00	3·0	..	..	Deepsea Stock Foods, 527 Collins-street, Melbourne

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4382, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron. (as Fe_2O_3).	Sulphur.	Iodine.	
STOCK LICKS—*continued.*	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
Miscellaneous—continued.								
Mineralox	22·0	8·00	20·00	4·00	3·0	..	..	Deepsea Stock Foods, 527 Collins-street, Melbourne
Vita Lick Concentrated D ..	..	13·00	17·30	1·30	1·7	8·0	Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Concentrated G ..	..	19·50	25·90	1·30	1·7	8·0	Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Mixed D	75·0	2·40	3·20	·25	·33	1·5	Mere Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Mixed G	75·0	3·67	4·93	·25	·33	1·5	Mere Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Extra Strength Mixed D	62·0	4·00	5·35	·40	·55	2·5	Mere Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Extra Strength Mixed G	62·0	6·10	8·10	·40	·55	2·5	Mere Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Por-co-vite	12·8	19·20	24·30	·83	·30	10·0	Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Chic-a-vite	..	20·70	27·60	1·43	1·80	1·8	Mere Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Mineralized Block ..	82·0	2·15	4·90	·83	·10	..	..	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Carbofos Mineralized Block ..	77·0	4·30	7·75	·80	·10	..	..	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Red Blocks ..	82·0	3·60	5·80	·80	·30	·40	Merest Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Cattle Lick Concentrated D	..	15·77	20·50	1·33	·90	2·10	Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Cattle Lick Concentrated G	..	20·55	26·70	1·33	1·80	2·10	Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Cattle Lick Mixed D ..	74·0	2·84	3·70	·24	·17	·39	Merest Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Cattle Lick Mixed G..	74·0	3·76	4·91	·24	·35	·39	Merest Trace	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Vita Lick Mineralized Salt Fodder	25·0	..	..	·63	·15	..	..	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Foddalik (FL in square) ..	..	13·00	27·60	5·60	1·10	..	Merest Trace	The Mineral Foods Co. of Australia Pty. Ltd., Henty House, Little Collins-street, Melbourne
Allkon Block Lick	91·0	1·90	3·00	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Allkon Lick, No. 1	8·0	19·00	30·00	..	1·00	..	Trace	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Immunolic Concentrate ..	8·0	19·00	30·00	..	1·00	..	Trace	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Immunol Block Lick	91·0	1·90	3·00	..	..	..	..	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Sulphurized Block Lick ..	98·0	..	..	..	..	2·00	..	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Allkon Lick No. 2	5·0	15·00	25·00	..	1·00	1·0	Trace	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Allkon Organic Lime Compound	..	..	7·00	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Hart's Immunol Organic Lime Compound	..	..	7·00	..	..	..	..	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Vic-Lic Mixed G	78·0	5·50	6·00	..	1·4	..	Trace	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
Vic-Lic Mixed D	78·0	5·50	6·00	..	·7	..	Trace	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
Vic-Lic Concentrated	5·0	29·02	31·10	..	4·28	..	·03	Wilcox Mofflin Ltd., Henty House, 499 Little Collins-street, Melbourne
Evans Specific	..	3·00	13·40	2·22	40·00	10·00	Trace	Thomas' Sheep and Cattle Dips Pty. Ltd., 47 Adam-street, Burnley
C & B Tonic Mineral	63·00	8·80	6·90	·70	·40	7·70	..	J. S. Brewer, Rossiter's-road, Koo-wee-rup
Pegalick	38·0	13·5	17·5	..	·20	4·20	·04	C. E. Juchau, 396 Flinders Lane, Melbourne
Kelp-Lik	..	23·00	32·00	1·50	1·40	10·00	..	Kelp-Lik Products Pty. Ltd., 343 Little Collins-street, Melbourne
Nutra Min "A"	38·80	7·40	26·7	·6	·4	1·60	·03	S. N. Rodda Pty. Ltd., 65 Beach street, Port Melbourne
Vetsolick	Trace	19·00	26·20	·65	1·55	14·20	·05	A. H. McDonald and Co. Pty. Ltd., 568 Bridge-road, Richmond
Rudduck's Medicated Tonic ..	60·0	8·20	7·80	·71	..	5·20	..	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
Rudduck's Improved Mineral Lick	20·0	16·00	24·00	·60	·88	2·00	.03	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
Rudduck's Tonic and Vermicide	..	18·80	26·00	1·00	1·30	·50	·04	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
Allkon Mineral Poultry Food ..	4·0	11·0	30·0	..	·5	·5	Trace	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne

LIST OF STOCK FOODS AND STOCK LICKS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936, No. 4382, FOR THE YEAR 1940—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron. (as Fe_2O_3).	Sulphur.	Iodine.	
STOCK LICKS—*continued.*	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.	
Miscellaneous—continued.								
Allkon Organic Lime Compound (Special)	..	..	7·0	..	..	..	3·0 (Fat)	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Wagstaff's Medicated Salt Compound	59·2	6·5	8·5	Trace	·37	3·2	.04	B. Wagstaff, 7–9 Kavanagh-street, South Melbourne
Wagstaff's Mineral Concentrate	..	19·0	20·0	·65	1·55	14·2	..	B. Wagstaff, 7–9 Kavanagh-street, South Melbourne
Vetamac Mineralized Block Lick	84·0	3·1	4·3	·11	·30	2·4	Trace	A. H. McDonald and Co. Pty. Ltd., 568 Bridge-road, Richmond
Welco Stock Lick	1·0	20·0	38·0	·12	2·40	..	·15	Welch, Perrin and Co. Pty. Ltd., 48–56 Queensbridge-street, South Melbourne
Salvitis Mineral Lick, No. 2 ..	70·0	7·1	8·8	·2	·80	4·0	..	The Cheetham Salt Pty. Ltd., Little Malop-street, Geelong
Salvitis Iodised Mineral Lick, No. 2	70·0	7·1	8·8	·2	·80	4·0	.05	The Cheetham Salt Pty. Ltd., Little Malop-street, Geelong
Salvitis Iodised No. 1 ..	90·0	1·8	2·5	·2	·80	·4	·05	The Cheetham Salt Pty. Ltd., Little Malop-street, Geelong
Salvitis Iodised Concentrate No. 1	..	18·8	25·0	2·0	8·4	4·4	·50	The Cheetham Salt Pty. Ltd., Little Malop-street, Geelong
Hart's 10% Bone Meal Blocks ..	91·0	2·5	3·5	..	..	..	..	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Hart's Bone Meal and Protein Blocks	91·0	1·2	1·7	..	..	..	..	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Hart's Immunol Organic Lime Compound Special	..	..	7·0	..	..	..	..	Hart and Co. Pty. Ltd., 72–86 Whiteman-street, South Melbourne
Welco 10% Bone Meal Block	90·0	2·5	3·5	..	..	..	..	Welch, Perrin and Co. Pty. Ltd., 48–56 Queensbridge-street, South Melbourne
Vetamac Medicated Lick ..	55·0	6·7	8·3	Trace	6·5	4·0	0·05	A. H. McDonald and Co. Pty. Ltd., 568 Bridge-road, Richmond
Telson Concentrated Stock Tonic	8·2	8·4	28·9	2·8	6·6	..	Mere Trace	R. F. Murray, 28 Rooney-street, Richmond
Telson Poultry Powder ..	8·9	16·0	4·9	2·6	1·3	4·0	0·09	R. F. Murray, 28 Rooney-street, Richmond
G.T.S. Sulphurised Salt Block	98·0	..	..	..	..	2·0	..	Permewan Wright Ltd., 31 King-street, Melbourne
G.T.S. Mineralised Salt Block	90·0	2·5	3·5	..	..	..	..	Permewan Wright Ltd., 31 King-street, Melbourne
Lictone (Sheep)	..	..	22·0	5·5	20·8	..	..	Permewan Wright Ltd., 31 King-street, Melbourne
Lictone	..	..	44·0	5·0	14·6	..	..	Permewan Wright Ltd., 31 King-street, Melbourne
Hea-Con Salt	61·0	7·0	8·5	0·5	0·2	5·0	0·05	F. Fisher Pty. Ltd., High-street, Maryborough
Watkins Mineralised Stock Tonic	..	21·2	28·0	1·2	1·8	6·0	Trace	J. R. Watkins Company, 262 Exhibition-street, Melbourne
Watkins Mineralised Poultry Tonic	14·0	15·7	23·7	1·3	1·6	4·0	Trace	J. R. Watkins Company, 262 Exhibition-street, Melbourne
Osmond Concentrated Lick (Cattle)	..	15·0	15·0	1·2	0·7	12·0	0·04	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
D.G.L. Concentrated Lick ..	..	23·0	32·0	1·5	1·4	10·0	..	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Cenovis Yeast Mineralised Lick	38·0	8·1	18·8	0·5	0·6	3·0	..	Cenovis Stock and Poultry Food Company, 567 Flinders-street, Melbourne
Eureka Mineral Poultry Food..	..	2·1	4·4	Trace	Trace	0·2	Trace	S. Cochrane, 1A Centre Way, Prahran, Melbourne

NOTE.—Under the Stock Foods Acts the analysis is not shown on the labels attached to bags of bran and pollard but all bran and pollard sold must comply with the prescribed standard analysis.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

Melbourne, 30th April, 1940.

Standard Herd Records

For Quarter ended 31st March, 1940

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 247, of which 200 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year old (between 4 and 4½ years at time of calving) ..	310 lb. butter-fat.
Senior 4-year old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

(Except where otherwise stated, the period of test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Alston, N. B. and Sons, Romsey, Jersey (1).										
Rosyth Sweetbread ..	50506	17.5.39	23	9,150	5·56	508·61	350	Mature	235, 264, 291, 300	Aveley Antony
Atkinson, W. K., Swan Hill, Dairy Shorthorn (9).										
Willow Park Blush 5th ..	1202E	10.6.39	28	10,805	4·02	434·12	350	Mature	393, 430, 428, 438, 409	Willow Park Banker 2nd
Willow Park Comet 17th ..	531D	14.6.39	11½	8,003	4·00	319·83	290	Sr. 3	273 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 18th ..	343C	24.6.39	29	9,364	4·31	403·92	250	Sr. 2	.. ..	Anderson's Imperial Cran 6th (Imp.)
Willow Park Countess 10th	1245E	15.6.39	28½	11,039	3·89	429·19	350	Mature	371, 415, 405, 451, 524	Willow Park Reflector
Willow Park Countess 21st	538D	23.6.39	4½	6,254	3·70	231·63	270	Jr. 3	237 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Countess 23rd	Vol. 2	14.5.39	19	7,962	3·56	283·45	250	Sr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Dainty 8th ..	1257E	18.4.39	12½	8,644	4·06	351·18	350	Mature	301, 392, 437	Willow Park Sherlock
Willow Park Melba 25th ..	554D	25.6.39	23½	9,806	3·84	376·59	310	Jr. 4	282 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Queenie 37th	1367E	22.4.39	21½	7,188	3·93	282·83	290	Sr. 3	247 ..	Willow Park Silvermine 8th
Austin F., Lara, Jersey (6).										
Avalon Madeira's Duchess	56188	4.6.39	26½	9,381	5·61	525·97	310	Jr. 4	358, 488 ..	Mornmoot Prince Madeira
Avalon Madeira's Pansy 2nd	60360	3.6.39	17	7,314	5·92	433·34	250	Sr. 2	471 ..	Mornmoot Prince Madeira
Avalon Noble's Pansy 9th ..	47059	31.5.39	24	8,274	5·63	466·20	350	Mature	328, 398, 359, 512	Noble of Avalon
Avalon Starbright's Pansy 4th	56189	31.5.39	17	8,976	5·82	521·96	290	Sr. 3	341, 452 ..	Brucevale Lord Starbright 3rd
Avalon Starbright's Pansy 5th	56190	30.5.39	11	9,065	5·37	486·66	290	Sr. 3	344, 414 ..	Brucevale Lord Starbright 3rd
Avalon Starbright's Queen	56192	16.5.39	13½	7,640	5·96	455·54	290	Sr. 3	363, 455 ..	Brucevale Lord Starbright 3rd
Ballarat Orphanage, Ballarat, Jersey (6).										
Murona Tiddlewinks ..	68158	27.4.39	21½	6,545	5·71	373·79	230	Jr. 2	.. ..	Banyule Balliol
Orphanage Audrey's Molly 5th	54575	3.5.39	19	8,666	5·44	471·21	350	Mature	332 ..	Jerseylea Quality Boy
Orphanage Handsome ..	49969	22.6.39	20	7,832	5·25	411·18	350	Mature	.. ..	Murona Airmine
Orphanage Melba 11th ..	63536	2.5.39	24	7,820	5·76	450·17	250	Sr. 2	313 ..	Murona Twylair
Orphanage Pearl 7th ..	54579	30.3.39	29	9,498	4·69	445·74	350	Mature	314, 476 ..	Orphanage V.C.'s Trooper
Orphanage V.C. Molly	36860	13.5.39	16	7,263	4·49	326·12	350	Mature	367, 443, 319, 429, 382	Wompini V.C.
Black Estate, Late I. S. Noorat, Ayrshire (2).										
Mount Noorat Boronia 3rd	29776	28.4.39	23½	9,611	4·26	409·72	290	Sr. 3	328 ..	Gowrie Park Scottish Patron
Mount Noorat Georgina 4th	28721	25.4.39	14½	8,189	4·85	396·88	350	Mature	280 ..	Gowrie Park Scottish Patron
Broad, Mrs. A. A., Sutton Grange, Jersey (1).										
Grangelea Gladys ..	66756	8.4.39	15½	5,573	5·68	316·66	250	Sr. 2	.. ..	Grangelea Ruddigore
Bull, S. A., Paschendale, Jersey (1).										
Glen Leigh Dimple ..	52823	6.6.39	13½	8,036	5·62	451·63	310	Jr. 4	345 ..	Glen Leigh Bounty
Butcher, F. T., Murraydale, Red Poll. (1).										
Maryville Eva	2506C	17.5.39	24	8,804	4·45	391·46	350	Mature	355, 362, 493, 496, 525, 493	Victoria King Bird

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Calf, A. J., Werribee South, Jersey (3).										
Clarendon Eyre Tangerine 4th	39261	14.6.39	23	8,859	5·09	450·77	350	Mature	408, 470 ..	Clarendon Eyre Happy Husband
Illillouette Aristocrat's Countess	67061	1.6.39	22	7,593	5·48	416·12	290	Sr. 3	344, 332 ..	Illillouette Carilla's Aristocrat
Illillouette Aristocrat's Tangerine	53252	19.5.39	20	6,983	5·80	404·87	350	Mature	300, 385, 330	Illillouette Carilla's Aristocrat
Chadderton, J. E., Hamilton, Jersey (3).										
Glen Leigh Dawn 2nd ..	48264	10.5.39	19	8,009	6·13	491·03	350	Mature	370, 404, 371	Glen Leigh Bounty
Glen Leigh Destiny 3rd ..	61707	21.6.39	15	5,437	6·04	328·58	230	Jr. 2	.. ..	Selsey Jupiter
Glen Leigh Duchess 6th ..	57360	18.5.39	20½	7,455	6·68	497·77	290	Sr. 3	273 ..	Selsey Jupiter
Chirnside, R. M., Whittlesea, Jersey (2).										
Mornmoot Fancy Starbright 3rd	63199	14.6.39	18	7,643	5·53	422·83	230	Jr. 2	.. ..	Werribee Madeira's Ace
Werribee Princess Satisfaction	28543	11.6.39	17½	10,604	6·06	642·88	350	Mature	595, 587, 680, 712, 744, 657	Werribee Butter King
Clark, P. W., Whittlesea, Jersey (3).										
Coodardy Centurian Gloria	Vol. 27	10.6.39	15	6,131	4·39	269·45	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Gentle Aldanesse	C.R.	16.6.39	22	7,001	4·74	331·95	290	Sr. 3	.. ..	Staghorn Lord Aldan
Coodardy Gloria 7th ..	C.R.	5.6.39	24½	9,761	5·67	553·61	350	Mature	243, 368, 284	Toorongo Bell's Bonaparte
Colenso, L. W. R., Alvie, Jersey (15).										
Normandie Alsyke 3rd ..	68358	18.5.39	16	5,202	4·78	252·93	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Buttercup 2nd	33188	26.6.39	18	7,724	5·71	441·18	350	Mature	317, 486, 412, 447 475, 375, 337, 330	Peer of Lewisham
Normandie Golden Nancy	49869	23.4.39	19½	6,614	5·98	395·72	350	Mature	352, 356, 352, 374	Normandie Golden Peer
Normandie Golden Nancy 3rd	68359	16.5.39	16½	5,930	6·46	383·37	230	Jr. 2	.. ..	Normandie Majestic
*Normandie Hawthorn 4th	45471	17.6.39	4	3,915	5·44	212·84	350	Mature	383, 368, 322, 328	Peer of Lewisham
Normandie Hawthorn 6th	54489	16.6.39	13½	8,916	4·98	443·76	350	Mature	258, 263	Lucerne Vale Noble Master
Normandie Hawthorn 12th	63438	24.6.39	17	7,146	5·61	401·07	270	Jr. 3	180 ..	Normandie Mayflower's Fancy Masterpiece
Normandie Hawthorn 14th	68360	28.5.39	13½	4,526	4·91	222·11	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Hawthorn 15th	68361	24.5.39	23	6,559	4·62	302·72	230	Jr. 2	.. ..	Lewisham Playboy
Normandie Ilma 4th ..	58745	20.4.39	31	7,746	5·24	405·59	330	Sr. 4	247, 302 ..	Normandie Majestic
Normandie Ilma 5th ..	58746	14.6.39	25	9,450	5·06	478·36	310	Jr. 4	227, 265 ..	Normandie Majestic
Normandie Ilma 7th ..	68362	17.5.39	10½	4,317	5·45	235·21	230	Jr. 2	.. ..	Normandie Majestic
Normandie Mayflower 11th	68365	28.5.39	11½	3,985	6·02	239·87	230	Jr. 2	.. ..	Normandie Majestic
Normandie Primrose 3rd ..	45474	30.4.39	22½	7,438	5·97	443·86	350	Mature	280, 335, 325 279, 305	Peer of Lewisham
Normandie Vanilla ..	63440	15.6.39	17	7,647	5·64	431·24	270	Jr. 3	231 ..	Normandie Majestic
Coulthard, J. L. and Son, Whittlesea, Jersey (2).										
Walamba Lady ..	64779	12.5.39	17	7,512	5·62	421·92	330	Sr. 4	294, 274, 336	Banyule Airo
Walamba Merry Lou ..	69565	11.4.39	11	4,442	5·05	224·47	230	Jr. 2	.. ..	Clarendon Eyre Brigadier 3rd
Crawford, Mrs. E., Traralgon, Jersey (4).										
Balneil Master's Idyll ..	65315	24.5.39	10	6,258	6·00	375·40	270	Jr. 3	.. ..	Werribee Royal Master
Balneil V.C.'s Duchess ..	65318	19.6.39	9½	7,833	5·15	403·13	270	Jr. 3	.. ..	Werribee Royal Master
Pine Grove Master's Larkspur	36798	1.5.39	12	7,371	5·49	404·82	350	Mature	.. ..	Werribee Grand Master
Yuleba Larkspur ..	65057	16.6.39	10½	5,949	5·65	336·12	310	Jr. 4	248	War Valour (Imp.)
Daley, Mrs. G. S., Lilydale, Jersey (1).										
Karrara Golden Jean ..	62439	19.6.39	13	6,144	5·61	344·53	270	Jr. 3	278 ..	Rochette's Golden (Imp.)
De La Rue, N. C., Weering, Jersey (3).										
Gladfield Bonnie ..	48206	8.4.39	20½	7,513	5·78	433·91	350	Mature	305, 330 ..	Grangelea Dandy Mac
Lucerne Vale Madeira 3rd	49243	16.4.39	24½	9,128	5·98	545·60	330	Sr. 4	283, 335, 441	Lucerne Vale Grandmaster
Lucerne Vale Master's Silvermine	49248	11.6.39	11	6,324	5·91	373·71	350	Mature	284, 413, 339	Werribee Fancy Masterpiece
Department of Agriculture, Werribee, Friesian (2).										
Victoria Oxeye	Vol. 14	2.6.39	22	9,443	3·61	340·56	270	Jr. 3	335 ..	Victoria Double Top
Victoria Sonoreus Plebe ..	4289	20.4.39	42	14,474	3·41	493·36	350	Mature	441, 418, 491, 583	Victoria Topnote
Department of Agriculture, Werribee, Red Poll (12).										
Victoria Avocet	3892A	11.4.39	17½	7,838	3·95	309·40	350	Mature	215, 287, 355, 384, 282	Dominion Bright Belgian
Victoria Avrette	3893A	26.4.39	17	7,896	4·39	346·81	350	Mature	296, 292, 349, 320	Victoria Vice Captain
Victoria Bead	6708AA	14.4.39	18½	7,440	4·83	359·62	270	Jr. 3	.. ..	Woodburn Peter Pan
Victoria Belleraine ..	7008A	18.4.39	13	5,574	4·79	267·03	250	Sr. 2	.. ..	Woodburn Peter Pan
Victoria Bell Rose ..	3511AA	8.4.39	14½	8,414	4·07	342·11	350	Mature	253, 341, 327, 433	Victoria Major Royal
Victoria Bright Bess ..	3898A	5.6.39	11½	9,758	4·05	395·40	350	Mature	223, 312, 314, 321, 380	Dominion Bright Belgian
Victoria Johanna ..	3912A	15.6.39	22	9,614	4·60	442·63	350	Mature	321, 411, 514	Dominion Bright Belgian

* 180 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Department of Agriculture, Werribee, Red Poll (12).—*continued.*										
Victoria Keturah	6021A	21.6.39	18	8,559	3·77	323·01	350	Mature	..	Victoria Gallant
Victoria Kinetica	4889A	6.6.39	21½	10,358	4·25	439·88	350	Mature	277, 405	Victoria Gallant
Victoria Lady Velvet	2758AA	14.4.39	29	10,602	4·19	444·61	350	Mature	254, 333, 358, 415, 416	Earl of Beaconsfield
Victoria Mary Rose	6711AA	21.4.39	22½	7,605	4·20	319·22	250	Sr. 2	..	Chandpara Valentine
Victoria Prune	7021A	6.6.39	17	8,004	4·52	361·95	290	Sr. 3	277	Woodburn Peter Pan
Dookie Agricultural College, Dookie, Ayrshire (2).										
Dookie Agnes	30379	4.4.39	12½	7,988	4·11	328·55	310	Jr. 4	304	Longerenong Baron
Dookie Faith	27117	3.4.39	16½	9,965	4·06	404·61	350	Mature	368, 362, 382	Dookie Patron
Fadersen, J. H., Mandurang, Jersey (3).										
Banyarra Silvermine 3rd	51648	12.6.39	20	8,807	4·52	398·15	330	Sr. 4	303, 367	Banyarra Velvetâtion
Banyule Silvermine 89th	42891	27.5.39	23	8,338	4·92	409·85	350	Mature	305, 336, 332	Oxford's Beau's Pretty Oxford (Imp.)
Banyule Silvermine 113th	C.R.	18.6.39	19½	5,974	5·64	336·71	230	Jr. 2	..	Banyule Silvanus
Fairchild and Clutterbuck, Tinambra, Jersey (3).										
Banyule Lady Merton	60495	12.4.39	24	7,907	5·60	442·72	230	Jr. 2	..	Banyule Oxford Don
Vaucluse Blossom 2nd	55697	15.6.39	12½	5,004	5·73	286·91	350	Mature	296, 349	Somerville Concentration
Vaucluse Princess	55699	23.6.39	27	7,629	5·62	429·01	330	Sr. 4	253, 364, 325	Paisley Master
Fixter, A., Boisdale, Guernsey (4).										
Avanview Dulcie	2537	24.5.39	25	8,678	5·54	481·12	350	Mature	294, 317, 344, 348, 457, 428, 431	Melbourne Sandboy 6th
Avonview Golden Daffodil	3966	30.4.39	19½	8,474	5·50	465·82	350	Mature	307, 352	Avonview Golden Lord
Avonview Golden Fairy	3967	7.6.39	22½	8,648	5·93	512·79	350	Mature	455	Avonview Golden Lord
Avonview Princess 2nd	3969	16.4.39	24	8,967	5·42	486·17	350	Mature	337, 458	Avonview Golden Lord
Foster, A. O., Boisdale, Jersey (5).										
*Boisdale Brunette 3rd	38942	16.4.39	..	3,135	5·24	164·39	350	Mature	254, 306, 379, 391, 188	Gladiator of Springhurst
Boisdale Dawn	56432	8.6.39	11	6,125	5·55	339·80	310	Jr. 4	..	Boisdale Dazzler
Boisdale Netta 3rd	43053	25.6.39	7	6,321	4·37	276·44	350	Mature	..	Gladiator of Springhurst
Boisdale Twilight 2nd	56436	2.5.39	15	5,895	5·68	334·62	310	Jr. 4	256	Wompini Master Grey
Hazeldale Ginger Princess	40175	10.6.39	6	5.674	4·48	254·32	350	Mature	276, 225, 295, 240	Dinkum of Banyule
Fraser, G. A., Addington, Ayrshire (2).										
Bonnie Doon Bettina	31118	4.4.39	21	8,643	4·55	393·66	250	Sr. 2	..	Bonnie Doon Baronet
Bonnie Doon Sheila	31127	10.5.39	20½	8,290	4·65	385·47	230	Jr. 2	..	Bonnie Doon Raymond
Gay, R. G., North Devon, Jersey (1).										
Elm Grove Silvermine	39643	14.5.39	34½	10,394	5·70	592·65	350	Mature	310, 426, 414, 498, 288	Warenda Ragtime Dominant
Goddard, J. H., Cora Lynn, Ayrshire (1).										
Crescent Farm Beryl 3rd	C.R.	16.4.39	16½	7,745	4·36	337·62	270	Jr. 3	258	Crescent Farm Gordon
Grice, C. S., Somerville, Jersey (2).										
Grangelea Rosaleen	48524	20.5.39	19½	5,294	6·29	333·22	350	Mature	330, 303, 320	Banyule Macon
Somerville Heroine 7th	46154	31.3.39	26½	9,810	4·64	455·52	350	Mature	409	Somerville Reputation
Handbury, J. E., and Son, Toora (No. 2 Farm), Jersey (1).										
Tooravale Starleigh 8th	46480	8.5.39	10	7,106	6·15	436·81	350	Mature	236, 313, 361, 106	Kingsvale Monica 14th's Son
Handley, S. C., Dandenong, Jersey (1).										
Barrowby Rose Midget	65357	18.6.39	20	6,245	5·44	339·55	230	Jr. 2	..	Mornmoot Meteor
Harvey, T., Boisdale, Jersey (4).										
Jerseyholm Bluebell 30th	57844	8.4.39	11½	4,610	4·51	207·84	250	Sr. 2	231	Jerseyholm Master's Fox 6th
Jerseyholm Bluebell 32nd	62304	23.5.39	19	6,897	5·46	376·84	250	Sr. 2	..	Jerseyholm Master's Fox 35th
Jerseyholm Empress 44th	53361	10.6.39	12	7,949	4·53	360·04	330	Sr. 4	407	Jerseyholm Master's Fox 6th
Jerseyholm Empress 48th	57846	17.6.39	21½	7,730	5·11	395·18	310	Jr. 4	337	Jerseyholm Master's Fox 6th
Haywood, Dr. A. R., Hastings, Jersey (3).										
Windrest Day Lady	64937	7.4.39	14½	6,112	4·95	302·33	270	Jr. 3	237	Windrest Cherry's Chap
Windrest Jonquil	64938	5.4.39	9½	4,934	6·09	300·69	290	Sr. 3	269	Windrest Cherry's Picador
Windrest Twinkle's Dream	64940	27.4.39	6½	5,315	5·63	299·31	270	Jr. 3	249	Glen Iris Matador
Henderson, W., Grasmere, Ayrshire (8).										
†Carracoorte Balm 23rd	30253	4.5.39	..	5,010	4·43	221·79	350	Mature	263, 228	Carracoorte Gerty's Producer
Carracoorte Filpail 20th	24690	8.6.39	15	9,365	4·64	434·36	350	Mature	270, 444, 180, 350, 257	Carracoorte Lochiel
Carracoorte Filpail 22nd	29207	4.6.39	10½	6,658	4·69	312·37	330	Sr. 4	210, 200	Grandview Bernie
Carracoorte Muriel	28175	22.6.39	13	7,494	4·27	320·28	350	Mature	185, 245	Carracoorte Boomerang
Hazelmore Brownie 6th	Vol. 32	24.6.39	9	6,020	4·20	252·99	250	Sr. 2	..	Hazelmore Lucky Star
Jennewar Lilac	Vol. 32	20.6.39	14½	5,759	4·56	262·74	270	Jr. 3	..	Denbigh Ace
‡Jennewar Princess	31550	26.4.39	4	1,530	4·69	71·78	230	Jr. 2	..	Jennewar Gay Star
§Strathkellar Nymph	27754	3.6.39	6	4,656	4·93	229·66	350	Mature	186, 204, 175	Carracoorte Gerty's Producer

* 210 days in test (sold.) † 240 days in test (sold). ‡ 120 days in test. § 258 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Hore, E., Leitchville, Jersey (10).										
Milvue Countess	67984	22.6.39	22½	6,498	5·09	330·73	230	Jr. 2	.. ..	Milvue Bettwy's Master
Milvue Design's Dilys ..	67986	22.6.39	20	5,600	6·03	337·70	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Design's Honesty 2nd	63099	22.6.39	18½	6,801	5·97	406·10	250	Sr. 2	336 ..	Belgonia Suspense's Design
Milvue Design's Larkspur ..	63100	28.5.39	21	6,402	6·15	393·97	250	Sr. 2	396 ..	Belgonia Suspense's Design
Milvue Design's Tulip ..	67991	22.6.39	21½	7,757	5·08	394·16	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Eminent's Bettwys..	63101	24.5.39	19	7,092	4·83	342·45	250	Sr. 2	264 ..	Clarendon Eyre Eminent's Boomerang 4th
Milvue Madeira Chimes ..	54142	20.4.39	17	6,794	5·23	355·20	350	Mature	244, 229, 373	Balcairn Mabel's Master
Milvue Oxford's Queen ..	63102	14.4.39	12	3,775	6·38	240·85	250	Sr. 2	278 ..	Belgonia Suspense's Design
Milvue Perree's Dainty ..	63103	11.6.39	16½	6,704	4·83	323·67	250	Sr. 2	244 ..	View Banks Perree's Boy
Taranah Tulip	59636	21.4.39	17	7,302	4·64	339·02	330	Sr. 4	319, 372 ..	Taranah Hercules
Hore, M. T., Leitchville, Freisian (3).										
*Elmar Fay	C.R.	17.5.39	4	8,415	3·84	323·03	330	Sr. 4	356 ..	Greenvale Oakwood Posch
Elmar Lassie	C.R.	2.4.39	25	11,430	3·34	381·32	290	Sr. 3	298 ..	Elmar Sylvia's Lad
Elmar Roseleaf	Vol. 14	15.4.39	32	9,540	3·62	345·78	350	Mature	378 ..	Greenvale Oakwood Posch
Hubbard, A., Yarra Glen, Ayrshire (4).										
Emoh Ruo Alvie	C.R.	5.4.39	8	6,429	4·22	271·06	310	Jr. 4	.. ..	Fulham Fun
Emoh Ruo Lucy	28334	7.4.39	13	7,614	4·20	319·62	350	Mature	.. ..	Fulham Fun
Emoh Ruo Marcella ..	27150	19.5.39	12	8,382	4·01	336·19	350	Mature	.. ..	Oakbank Excellent
Sunnyside Miss Joyful 3rd	Vol. 32	26.5.39	18	7,839	4·58	359·11	350	Mature	.. ..	Oakbank Excellent
Huffer, J. A., Gormandale, Jersey (3).										
Glen Valley Handsome Duchess	66695	30.4.39	15	5,954	6·66	396·65	230	Jr. 2	.. ..	Glen Valley Aristocrat
Glen Valley Handsome Girl 2nd	40001	16.6.39	15	8,010	5·80	464·97	350	Mature	281, 367, 452, 353, 360	Glen Valley Butter Maker's Boy
Glen Valley Joyce ..	48439	22.6.39	13	6,849	6·26	429·03	350	Mature	305, 393, 325	Brucevale Wyandotte's King
Hurrey, Estate Late W. H., Koonwarra, Jersey (1).										
Kooreena Carrie 10th ..	67483	3.6.39	10	4,458	6·84	305·07	230	Jr. 2	.. ..	Kooreena Good Luck
Hutchison, H. McD., Yan Yean, Jersey (1).										
Eulomo Fancy Duchess ..	C.R.	2.4.39	15½	5,132	6·00	307·84	250	Sr. 2	.. ..	Melrose Outlook
Jones, A. C., Barnawartha, Illawarra Shorthorn (1).										
Raleigh Picture 13th ..	17806	28.5.39	10½	6,842	4·28	293·12	350	Mature	.. ..	Headlight of Raleigh
Leask, G. C., Garfield, Ayrshire (1).										
†Burghclere Beauty ..	30220	29.5.39	4	3,300	4·13	136·19	290	Sr. 3	.. ..	Wayside Wilfred
Le Noury E., Werribee South, Guernsey (2).										
Werribee Merry Maid ..	2638	14.6.39	12	5,601	5·72	320·57	350	Mature	214, 310, 300, 337, 325, 312	Yarraview Saxon
Werribee Princess Patsy ..	6485	22.6.39	4½	4,597	4·88	224·25	270	Jr. 3	237 ..	Werribee Prince Don
Longerenong Agricultural College, Dooen, Ayrshire (3).										
Longerenong Acacia Elata	26544	25.4.39	5	7,074	4·13	292·15	350	Mature	204, 192, 249, 259, 200, 282	Longerenong Baron
Longerenong Cedar Wattle 6th	30756	3.6.39	17½	6,173	4·38	270·65	230	Jr. 2	.. ..	Dookie Punch
Longerenong Laureate 4th..	30760	8.5.39	9½	4,229	4·48	189·34	230	Jr. 2	.. ..	Dookie Punch
Lyon, C. G., Heidelberg, Jersey (4).										
Banyule Hawthorn 21st ..	56253	4.4.39	25	8,775	5·12	449·26	230	Jr. 2	.. ..	Banyule Oxford Don
Banyule Molly 60th ..	56258	18.4.39	24	8,172	5·29	432·30	230	Jr. 2	.. ..	Banyule Oxford Don
Banyule Silvermine 116th ..	60502	14.5.39	21½	7,768	5·12	397·49	230	Jr. 2	.. ..	Banyule Triplane
Rowallan Attraction Madeira	64124	8.6.39	18	6,056	5·40	327·14	250	Sr. 2	.. ..	Banyule Oxford Don
Macauley, C. W., Rochester, Jersey (1).										
Taranah Floss 3rd ..	64461	25.4.39	26	7,796	5·23	407·52	290	Sr. 3	298 ..	Taranah Reliance
McCosh, S. J., Wandin North, Jersey (1).										
Heathermont Modesty's Rosette	66920	14.4.39	16	5,573	5·40	300·77	230	Jr. 2	.. ..	Glen Valley Masterman
McErvale, I. and Sons, Camperdown, Jersey (4).										
Cumnock Cyrilla ..	61240	10.6.39	16	6,543	4·89	320·11	350	Mature	284, 223 ..	Cumnock Fancy's Masterpiece
Cumnock Gay Lady ..	57027	14.6.39	25	9,098	4·59	417·21	350	Mature	318 ..	Cumnock Recovery
Glen Iris Design's Finesse ..	43966	12.6.39	16½	6,118	5·50	336·67	350	Mature	.. ..	Design's Ruler (Imp.)
Kameruka Ringdove ..	40472	27.5.39	14	6,623	5·03	333·31	350	Mature	279, 380 ..	Banyule Amplifier

* 240 days in test. † 150 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
McNabb, G. A. and Son, Irrewillipe East, Jersey (11).										
Avalon Madeira's Pansy 6th	65234	19.5.39	19½	7,874	5·64	444·41	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Maxon Bright Favourite 2nd	58343	7.4.39	19	6,158	5·37	330·56	290	Sr. 3	270 ..	Maxon Starbright's Prince 5th
Maxon Chieftain's Alsyke 2nd	54015	23.5.39	20	7,289	5·85	426·40	330	Sr. 4	327, 338 ..	Maxon Chieftain
Maxon Chieftain's Comprey 2nd	54016	27.5.39	15½	5,882	5·69	334·61	350	Mature	201, 329, 284	Maxon Chieftain
Maxon Chieftain's Lodestone 2nd	58347	1.4.39	20	6,533	5·93	387·58	290	Sr. 3	314, 325 ..	Maxon Chieftain
Maxon Count's Lodestone ..	40932	23.4.39	17	5,624	6·61	371·57	350	Mature	341, 356, 360, 416, 468	Maxon Count Graceful
Maxon Count's Ranunculus	58352	27.4.39	15	6,484	6·52	422·63	310	Jr. 4	321, 360 ..	Maxon Count Graceful
Maxon Easter Daisy 3rd ..	54022	1.6.39	19½	7,267	5·36	389·81	330	Sr. 4	233, 286 ..	Avalon Noble 8th
Maxon Noble's Bell ..	67853	10.4.39	18	5,253	5·75	301·96	230	Jr. 2	.. ..	Maxon Duchess' Noble
Maxon Noble's Goldfinch 2nd	54026	4.6.39	21½	8,353	6·97	582·03	330	Sr. 4	275, 393 ..	Avalon Noble 8th
Maxon Noble's Ranunculus 2nd	67854	29.4.39	17	6,442	6·20	399·50	230	Jr. 2	.. ..	Maxon Duchess' Noble
Meaklin Bros., Mooroopna, Dairy Shorthorn (2).										
Drumneil Lily	775E	14.5.39	43½	12,662	4·18	529·83	350	Mature	423, 474, 437	Willow Park Reformer
Drumneil Nellie 3rd ..	779E	11.6.39	27	10,026	3·52	352·61	350	Mature	328, 453, 367, 454	Willow Park Reformer
Medland, F. C., Shepparton, Jersey (3).										
*Maneroo Hope	45020	30.4.39	..	8,010	5·32	426·31	350	Mature	284, 400 ..	Wompini Royal Duke
†Maneroo Jade 2nd ..	62918	13.6.39	..	5,768	5·18	298·93	290	Sr. 3	.. ..	Kantara Handsome Boy
*Maneroo Matron ..	58287	27.4.39	..	4,943	6·14	303·71	290	Sr. 3	.. ..	Maneroo Daphne's Twylish Lad
Mesley, W. T., Dalyston, Jersey (3).										
‡Warenda Gazelle 20th ..	C.R.	12.6.39	4	3,427	5·19	177·87	230	Jr. 2	.. ..	Riverbank Royal Exchange
Warenda Mandoline 15th ..	64814	13.4.39	5½	4,127	6·18	254·88	250	Sr. 2	241 ..	Riverbank Royal Exchange
Warenda Philomel 6th ..	64815	18.6.39	10	6,022	6·84	411·64	290	Sr. 3	223, 290 ..	Warenda Perpetuate
Mitchell, R. H., Linton, Jersey (2).										
Brucevale King Lark's Satisfaction	37947	23.4.39	22½	6,818	6·73	459·07	350	Mature	336, 389, 381, 419	Werribee Wyandotte's King
Clifford Farm Belladonna	56817	18.4.39	15½	7,622	5·26	400·84	350	Mature	490 ..	Wompini V.C.
Moore, J. and Co., Hedley, Jersey (1).										
Tooloonook Sainfoin 6th ..	69401	25.4.39	10	5,385	5·15	277·43	250	Sr. 2	..	Latrobe Musician
Murdoch, J. T. and Son, Lismore, Jersey (2)										
Ismalia Petal	57782	4.4.39	19	6,608	5·71	377·00	310	Jr. 4	217, 323 ..	Murona Twylair
Wilton Countess	64934	8.4.39	18	6,594	4·50	297·03	290	Sr. 3	251 ..	Murona Twylair
Nicholas, M. A., Sherbrooke, Jersey (2).										
Brampton Standard Beauty (Imp.)	56046	6.6.39	19	7,997	5·05	403·76	310	Jr. 4	357, 330 ..	Brampton Sporting Standard
Selsey Cute Wyandotte ..	69058	24.4.39	16½	5,365	6·10	327·18	230	Jr. 2	.. ..	Samaris Golden Prince (Imp.)
Noble, T. M. and Sons, Maffra, Jersey (5).										
Clarendon Eyre Belladonna 5th	52250	14.4.39	24	6,863	5·56	381·31	350	Mature	293 ..	Clarendon Eyre Eminent's Achievement
Clarendon Eyre Tangerine 8th	47636	5.5.39	30	9,915	4·50	446·46	350	Mature	308, 370 ..	Victorious Pioneer (Imp.)
Finchley Handsome Lady 2nd	43886	26.6.39	N.o.c.	7,328	6·71	491·48	350	Mature	276, 415, 480, 504, 445	Finchley Lord Harmony
Finchley Vasilika ..	39744	10.6.39	14	5,442	6·44	350·65	350	Mature	390, 476, 403	Werribee Lord Burnham
Finchley Vasilika 3rd ..	66464	9.4.39	18½	6,206	5·99	371·93	230	Jr. 2	.. ..	Finchley Masterman
O'Neill, J., Echuca Village, Jersey (1).										
Ullina Bonnie	69475	12.4.39	16	5,258	6·35	333·84	250	Sr. 2	.. ..	Ballara Fancy King
Parks, L. A. and Sons, Romsey, Guernsey (1).										
Melbourne Golden Gem ..	4501	28.4.39	16	9,488	5·06	480·25	350	Mature	263, 335, 299, 327	Nundorah Climax
Pattison, F., Tongala, Ayrshire (2).										
Willow Park Peggy ..	31009	18.5.39	7½	6,389	4·36	278·69	330	Sr. 4	236, 288 ..	Fulham Beam
Willow Park Rosebud ..	31012	20.5.39	22	7,995	4·19	334·70	330	Sr. 4	268, 336 ..	Fulham Beam
Payne, A. E. T., Lilydale, Guernsey (2).										
Yarraview Charlotte ..	8193	26.5.39	22	7,161	5·66	405·16	230	Jr. 2	.. ..	Yarraview Clarion
Yarraview Clarabelle ..	8200	5.4.39	22	6,036	5·58	336·70	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Powell, Mrs. K. E., Bacchus Marsh, Jersey (1).										
Mount Violet Betty Bawn ..	68124	21.6.39	13	7,142	4·90	350·10	350	Mature	.. ..	Carson of Banyule

* 240 days in test (herd withdrawn). † 210 days in test (herd withdrawn). ‡ 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Read, Estate of Late J. D., Springhurst, Jersey (14).										
Springhurst Anemone's Bess	64269	5.4.39	18½	7,357	4·17	306·89	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Springhurst Anemone's May	64268	11.4.39	18½	5,919	5·03	297·88	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Springhurst Blonde Aconite	50622	3.6.39	21	8,862	5·44	482·31	350	Mature	436, 306, 528	Bellefaire Seaborn Success
Springhurst Blonde Nardoo	59485	6.4.39	20	7,964	6·12	487·62	270	Jr. 3	318 ..	Bellefaire Seaborn Success
Springhurst Blonde Nightshade	59486	11.4.39	24	9,515	5·21	495·83	250	Sr. 2	338 ..	Bellefaire Seaborn Success
Springhurst Blonde Romneya	55272	8.4.39	27½	8,702	6·01	523·17	310	Jr. 4	377, 399 ..	Bellefaire Seaborn Success
Springhurst Blonde Soya ..	59487	15.4.39	24	8,757	5·37	470·17	250	Sr. 2	362 ..	Springhurst Sybil Successor
Springhurst Brampton Tulip	64274	24.4.39	12½	5,589	5·03	281·32	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Springhurst Coronation Narcissus	50625	3.6.39	8	9,293	5·58	518·82	350	Mature	317, 428, 429	Springhurst Design's Analyst
Sprinhurst Glad Brinjal ..	64277	11.4.39	16½	6,740	5·33	358·94	230	Jr. 2	.. ..	Springhurst Sybil Successor
Springhurst Pet Tomato ..	64282	1.5.39	15½	6,695	5·13	343·50	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Springhurst Ronald's Alsyke	59498	14.4.39	14	9,051	6·02	544·61	250	Sr. 2	365 ..	Bellefaire Seaborn Successor
Springhurst Successor's Lily	59501	1.5.39	17	7,616	4·58	349·13	250	Sr. 2	309 ..	Springhurst Sybil Successor
Springhurst Warrior's Fairy	64288	13.4.39	18	7,637	4·31	329·08	230	Jr. 2	.. ..	Glen Iris Anemone's Standard
Riddell, K. J., Port Fairy, Jersey (3).										
*Park View Marina ..	C.R.	1.5.39	..	5,430	5·11	277·30	250	Sr. 2	.. ..	Staghorn Fancy Observer 2nd
†Rocroy Heather ..	C.R.	26.5.39	..	4,395	5·47	240·33	230	Jr. 2	.. ..	Staghorn Fancy Observer 2nd
Ti-Tree Duchess	59735	3.5.39	11	4,166	5·09	212·11	350	Mature	.. ..	Yarrock Vale Royal Duke
Ronalds, O., Tarago, Jersey (2).										
Jindivick Mona	67227	12.5.39	14½	5,879	6·15	361·33	250	Sr. 2	.. ..	Somerville Master Babs
Somerville Babs 11th ..	46149	3.5.39	24½	8,790	5·25	461·18	350	Mature	360, 621 ..	Somerville Renown
Salesian College, Sunbury, Friesian (3).										
‡Ingolston Madge ..	4097	9.4.39	4	12,420	3·49	433·48	350	Mature	379, 368, 478, 527	Awapuna Dutchman
Polygon Springfield Oak ..	4886	8.6.39	38½	15,019	3·85	578·83	350	Mature	..	Darenth Springfield Oak
Rupertswood Griselda ..	C.R.	15.5.39	20	9,822	3·93	385·61	230	Jr. 2	.. ..	Rupertswood Henry
Shearn, J., Jindivick, Jersey (2).										
Jindivick Rarity	67229	19.6.39	7½	5,393	6·07	327·15	290	Sr. 3	332 ..	Somerville Master Babs
Somerville Rosina 4th ..	69106	31.3.39	16	5,424	5·24	284·15	230	Jr. 2	.. ..	Brampton Pioneer Chief (Imp.)
Tait, W. G., Dreeite, Jersey (2).										
Stoneybank Jessie 2nd ..	64308	8.5.39	12½	7,372	5·71	420·66	330	Sr. 4	328 ..	Lucerne Vale Trixie's Masterpiece
Stoneybank Snowdrop 2nd	50656	6.6.39	22	7,756	6·40	496·56	350	Mature	.. ..	Melrose Curio
Thomas and Taylor, Hamilton, Ayrshire (1).										
Carracoorte Minnie 7th ..	24706	14.5.39	12	9,447	5·09	480·77	350	Mature	341, 292, 330, 426, 459	Carracoorte Lochiel
Tomasetti, B. G., Drouin West, Ayrshire (1).										
Glencorren Belle	28444	22.4.39	25½	9,122	4·59	418·52	350	Mature	268, 349, 372	Gowrie Park Scottish Emblem
Trevaskis, F. T., Tongala, Jersey (1).										
Ballara Model 12th ..	51629	1.4.39	15	6,834	5·87	401·25	310	Jr. 4	248 ..	Kyora Dream's Gadget 2nd
Trewin, J. V., Nathalia, Jersey (3).										
Weir View Golden Design 4th	61854	6.6.39	17	5,982	4·71	281·75	230	Jr. 2	.. ..	Malwand Idealist 2nd
Weir View Wattle's Ideal ..	59972	13.6.39	15	6,560	5·48	359·61	250	Sr. 2	343 ..	Malwand Idealist 2nd
§Weir View Wattle's Ideal 2nd	64856	21.6.39	..	5,363	5·17	277·44	230	Jr. 2	.. ..	Malwand Idealist 2nd
Vaughan Bros., Girgarre, Jersey (3).										
Lynroy Gladys 4th ..	62866	15.6.39	12	5,796	5·98	346·86	290	Sr. 3	398, 325 ..	Werribee Laverock
Lynroy Graceful	58250	22.5.39	25	8,706	5·48	477·20	350	Mature	294, 566, 523, 482	Sherborne Wyandotte King
Lynroy Lady Glossy ..	C.R.	13.6.39	17	6,068	5·07	307·37	230	Jr. 2	.. ..	Werribee Laverock
Wade, W. J., Stratford, Jersey (4).										
Inverboom Bunty's Empress	57760	8.5.39	23	8,336	5·26	438·21	290	Sr. 3	297 ..	Grangelea Butter Boy 3rd
Inverbroom Silver Muriel 3rd	53274	19.6.39	16½	6,890	5·56	383·42	330	Sr. 4	230, 368 ..	Economist of Aveley
Inverbroom Silvermine's Marie	44392	5.5.39	29½	10,484	5·62	589·10	350	Mature	429, 455, 495, 476	Economist of Aveley
Troed-yr-Rhiw Nanno 5th ..	64660	4.6.39	15	5,490	5·30	290·79	250	Sr. 2	.. ..	Troed-yr-Rhiw Picador
Walker, C. S., Swan Hill, Friesian (1).										
Warwick Leonora Walker ..	C.R.	11.5.39	37	16,191	3·22	520·60	330	Sr. 4	259, 349 ..	Hengest Matador Walker

* 240 days in test (herd withdrawn). † 210 days in test (herd withdrawn.) ‡ 240 days in test. § 240 days in test (dead).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Walker, C. S., Swan Hill, Jersey (3).										
Clarendon Eyre Utopia 10th	65957	21.4.39	20½	6,130	5·11	313·02	230	Jr. 2	.. ..	Clarendon Eyre Golden Oxford
Grangelea Golden 5th ..	66757	29.4.39	16½	5,838	5·84	341·10	270	Jr. 3	251 ..	Grangelea Prosper 5th
Warwick Polly 2nd ..	46642	4.6.39	17½	8,523	5·31	452·38	350	Mature	227, 324, 321, 454, 439	Preston Star King
Warragul High School, Warragul, Red Poll (1).										
Gipps Lady Judith ..	4627A	17.6.39	6	5,103	3·66	186·80	310	Jr. 4	208, 236 ..	Blackwood Butler
Watson, K. E., Pakenham Upper, Jersey (3).										
Goronga Farm Fancy Modiste	C.R.	24.6.39	10	4,545	6·66	302·85	270	Jr. 3	.. ..	Werribee Alanda
*Goronga Farm Rondo ..	61926	22.6.39	..	4,035	5·74	231·52	310	Jr. 4	184 ..	Werribee Alanda
Arranmore Pinafore 2nd ..	56135	23.6.39	10	4,920	4·89	240·61	330	Sr. 4	183 ..	Clarendon Eyre L'Aiglon
Wilson, A., Port Fairy North, Ayrshire (6).										
Carracoorte Brownie's Petunia	29203	14.4.39	6	5,373	4·51	244·13	310	Jr. 4	231, 332 ..	Carracoorte Boomerang
Carracoorte Bunty 27th ..	29204	16.4.39	7½	7,328	3·72	272·73	330	Sr. 4	249, 352 ..	Carracoorte Boomerang
Carracoorte Iris 26th ..	29209	3.4.39	12	5,706	3·63	207·30	350	Mature	221, 231 ..	Grandview Bernie
Carracoorte Viola 34th ..	29211	4.6.39	16½	8,945	3·77	337·29	330	Sr. 4	247, 299 ..	Grandview Bernie
Lough View Beauty ..	Vol. 32	14.4.39	18	7,449	4·14	308·49	250	Sr. 2	.. ..	Carracoorte Bobby
Lough View Bellona ..	Vol. 32	4.5.39	13	6,339	3·84	243·32	250	Sr. 2	.. ..	Carracoorte Bobby

* 240 days (sold).

T. Rider, Government Printer, Melbourne.

Standard Herd Records

For Quarter ended 30th June, 1940

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 818, of which 672 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year old (between 4 and 4½ years at time of calving) ..	310 lb. butter-fat.
Senior 4-year old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

(Except where otherwise stated, the period of test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Alston, Estate of Late N. B. and Sons, Romsey, Jersey (7).										
Romsey Gay Grevillea ..	C.R.	5.8.39	15	6,915	5·50	380·02	290	Sr. 3	.. ..	Rosyth Jessie's Chief 5th
Rosyth Gay Bonnie ..	59331	3.9.39	14	6,882	5·85	402·80	330	Sr. 4	209, 262, 310	Werribee Gaypiece
Rosyth Meadow Lark ..	55126	4.7.39	24½	8,579	5·94	509·73	350	Mature	330, 277, 395	Werribee Gaypiece
Rosyth Noble Countess ..	59335	13.9.39	18	8,901	6·03	536·81	330	Sr. 4	272, 217 ..	Werribee Gaypiece
Rosyth Noble Duchess 3rd..	69016	13.9.39	10	6,356	5·93	376·83	270	Jr. 3	296 ..	Rosyth Jessie's Chief 5th
Rosyth Noble Duchess 4th	Vol. 27	28.8.39	9½	4,312	5·57	240·26	230	Jr. 2	.. ..	Rosyth Prince Madeira
Wompini King's Bell ..	64956	22.9.39	10½	6,572	5·83	383·36	290	Sr. 3	261, 343 ..	Wompini Erl King
Anderson, I., Warburton, Jersey (5).										
Banyarra Soprano 2nd ..	56252	31.8.39	13	5,844	5·10	297·86	270	Jr. 3	212 ..	Banyarra Velvetation
Banyule Molly 55th ..	56254	31.8.39	20½	7,217	5·80	418·52	270	Jr. 3	300 ..	Banyule Ettie's Oxford
Banyule Pert	56259	16.8.39	20	6,660	5·20	346·59	290	Sr. 3	294 ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Silvermine 117th ..	C.R.	30.8.39	18	5,829	4·77	278·16	230	Jr. 2	.. ..	Banyule Oxford Don
Southdean Haughtiness ..	59462	19.8.39	17½	6,068	5·85	355·17	270	Jr. 3	281 ..	Banyule Ettie's Oxford
Andrew, W., Whittlesea, Ayrshire (4).										
Conron Ada 2nd	29233	3.9.39	11½	7,459	4·65	346·65	350	Mature	.. ..	Conron Luminous
*Kelvin Grove Gay Lass ..	30351	20.8.39	4	5,955	4·21	250·41	330	Sr. 4	.. ..	Kelvin Grove Royalty
Kelvin Grove Radiant ..	32647	6.9.39	18½	7,731	4·44	343·41	250	Sr. 2	.. ..	Kelvin Grove Royalty
Kelvin Grove Rosella ..	32648	4.9.39	12½	8,210	4·08	334·95	290	Sr. 3	.. ..	Alan Vale Whynot
Atkinson, W. K., Swan Hill, Dairy Shorthorn (31).										
Willow Park Blush 8th ..	516D	13.9.39	6½	7,959	3·66	291·66	330	Sr. 4	320 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Blush 10th	Vol. 2	8.9.39	22	9,359	3·77	352·54	250	Sr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 15th	521D	16.9.39	9½	8,494	3·57	303·00	330	Sr. 4	289 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 17th	523D	16.9.39	22½	9,460	3·96	374·19	310	Jr. 4	357 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 18th ..	524D	7.8.39	29	10,980	3·85	422·63	290	Sr. 3	332 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 20th ..	526D	19.8.39	4½	7,815	3·60	281·52	270	Jr. 3	336 ..	Wickelsham Lord Barrington 5th (Imp.)
Willow Park Camelia 24th ..	Vol. 2	4.9.39	19½	6,777	4·00	271·02	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 9th ..	1233E	10.9.39	5½	7,827	3·43	268·15	350	Mature	343, 360, 406 397	Willow Park Imperial 3rd
Willow Park Countess 17th	534D	2.8.39	26	11,253	3·92	440·89	330	Sr. 4	321, 382 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Countess 22nd	539D	27.8.39	15½	8,874	3·16	280·29	270	Jr. 3	272 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Countess 27th	Vol. 2	19.8.39	20	7,322	3·82	279·36	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Dainty 4th ..	1253E	25.9.39	17½	9,210	3·97	365·38	350	Mature	333, 385, 367, 438, 447, 407	Willow Park Eminent
Willow Park Dainty 12th ..	540D	19.9.39	9	6,233	3·29	205·33	350	Mature	275, 359, 326	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Dainty 14th ..	Vol. 2	24.9.39	7½	8,633	3·62	312·64	250	Sr. 2	301 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Damsel 4th ..	1265E	26.9.39	8	9,504	3·44	326·64	350	Mature	257, 369, 345, 360	Willow Park Lustre 3rd
Willow Park Damsel 5th ..	1266E	29.8.39	7	9,336	3·80	354·84	330	Sr. 4	243, 338, 349	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Damsel 6th ..	1267E	22.9.39	4½	6,562	3·47	227·77	290	Sr. 3	218, 259 ..	Wicklesham Lord Barrington 5th (Imp.)

* 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Atkinson, W. K., Swan Hill, Dairy Shorthorn (31)—*continued.*										
Willow Park Duchess 31st	546D	16.8.39	11	8,594	3·30	283·80	290	Sr. 3	338 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 33rd..	Vol. 2	24.9.39	18½	9,176	3·98	364·81	250	Sr. 2	335 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Fairy 10th ..	550D	14.9.39	26	9,719	3·50	352·20	310	Jr. 4	269, 325 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Fairy 11th ..	557D	13.8 39	5	5,490	3·70	202·95	270	Jr. 3	245 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Fairy 12th ..	Vol. 2	5.9.39	32½	9,602	3·69	354·21	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Fairy 13th ..	Vol. 2	17.9.39	23½	9,144	3·67	335·25	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Melba 22nd ..	1321E	14.9.39	14	9,795	3·89	380·98	350	Mature	328, 363, 408	Willow Park Lestre 3rd
Willow Park Melba 24th ..	553D	29.8.39	6	7,459	3·72	277·80	330	Sr. 4	277, 365 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 26th ..	555D	17.9.39	19½	8,441	3·68	310·59	290	Sr. 3	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 27th ..	556D	5.8.39	18	9,504	3·96	376·47	270	Jr. 3	301 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Moss Rose 8th	1329E	18.9.39	21½	11,354	3·64	412·97	350	Mature	404, 438 ..	Willow Park Sherlock
Willow Park Moss Rose 11th	557D	29.8.39	10½	10,052	3·22	323·18	330	Sr. 4	344 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Queenie 41st ..	563D	27.8.39	9½	8,219	3·75	307·88	250	Sr. 2	312 ..	Wicklesham Lord Barrington 5th (Imp.)
*Willow Park Rosebud ..	243A	9.9.39	4	5,355	3·34	178·75	310	Jr. 4	241, 273 ..	Steventon Forester
Austin, F., Lara, Jersey (12).										
Avalon Gladstar's Daisy 3rd	51558	2.9.39	20	8,402	5·72	480·52	350	Mature	396, 464 ..	Avalon Gladstar 2nd
Avalon Madeira's Daisy ..	65230	26.7.39	19	6,536	5·39	352·61	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Avalon Madeira's Duchess 3rd	60358	5.8.39	20	8,009	5·33	427·17	250	Sr. 2	327 ..	Mornmoot Prince Madeira
Avalon Madeira's Duchess 5th	65231	30.7.39	15½	6,827	5·21	355·85	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Avalon Madeira's Duchess 6th	65232	25.9.39	20	6,374	5·82	370·94	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Avalon Madeira's Pansy ..	60359	19.7.39	22	9,359	5·62	526·26	270	Jr. 3	293 ..	Mornmoot Prince Madeira
Avalon Madeira's Pansy 5th	65233	21.9.39	17½	6,713	5·82	390·42	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Avalon Starbright's Beauty	51560	16.8.39	18	9,141	5·81	530·74	330	Sr. 4	453, 524 ..	Brucevale Lord Starbright 3rd
Avalon Starbright's Duchess	47062	24.9.39	25	9,869	6·13	605·17	350	Mature	429, 499, 529, 611	Brucevale Lord Starbright 3rd
Avalon Starbright's Duchess 2nd	51561	2.9.39	27½	10,332	5·33	550·62	330	Sr. 4	403, 388 ..	Brucevale Lord Starbright 3rd
Avalon Starbright's Pansy 3rd	51563	7.7.39	23	9,150	5·94	543·19	330	Sr. 4	360, 482 ..	Brucevale Lord Starbright 3rd
Avalon Starbright's Pansy 7th	65238	5.8.39	20½	8,192	5·07	415·15	230	Jr. 2	.. ..	Avalon Starbright 8th
Ballarat Orphanage, Ballarat, Jersey (9).										
Merunda Delight ..	49537	17.8.39	16½	5,405	5·37	290·11	350	Mature	433 ..	Murona Airmine
Orphanage Attraction 13th	Vol. 27	26.7.39	24	8,034	4·58	370·48	250	Sr. 2	.. ..	Retford King Bracken
Orphanage Bettine 2nd ..	68454	2.8.39	21½	7,376	5·32	392·10	250	Sr. 2	.. ....	Orphanage Arvey
Orphanage Doris 3rd ..	49968	26.7.39	28	10,188	4·51	459·96	350	Mature	352, 352 ..	Murona Airmine
Orphanage Melba 9th ..	63535	4.9.39	15½	8,775	5·37	471·41	290	Sr. 3	.. ..	Rowallan Celebrity
Orphanage Molly 4th ..	58822	7.7.39	21	7,593	6·18	469·56	350	Mature	358, 265, 292	Jerseylea Quality Boy
†Trawalla Lassie 7th ..	59781	25.7.39	..	5,415	4·90	265·40	290	Sr. 2	.. ..	Glen Iris Viola's Lord
Orphanage Attractive 8th..	58808	31.8.39	20	6,952	6·39	443·97	270	Jr. 3	.. ..	Rowallan Celebrity
Orphanage Quicksand 4th	49977	22.7.39	25½	9,069	5·58	505·76	350	Mature	394, 434 ..	Jerseylea Quality Boy
Barkla, R. E., and Son, Joyce's Creek, Jersey (2).										
Grangelea Doris 4th ..	66754	13.9.39	9	2,690	6·74	181·39	270	Jr. 3	.. ..	Grangelea Victor 3rd
Ismalia Petal 4th ..	67121	7.9.39	9½	4,559	5·17	235·48	230	Jr. 2	.. ..	Retford King Bracken
Bennett, R. H., Lancefield, Jersey (9).										
Belgonia Junette 4th ..	56322	4.8.39	12½	5,906	6·52	384·95	290	Sr. 3	.. ..	Design's Ruler (Imp.)
Edenhope Madeira ..	57121	14.8.39	14½	7,447	5·61	417·81	350	Mature	.. ..	Rosyth Wee Macgregor
Edenhope Milk Maid ..	66304	25.7.39	15	6,663	5·05	336·41	230	Jr. 2	.. ..	Edenhope Masterpiece
‡Edenhope Modesty ..	Vol. 27	20.9.39	4	2,880	4·96	142·91	230	Jr. 2	.. ..	Edenhope Canary's Count
Edenhope Molly's Fairy ..	Vol. 27	18.8.39	12½	6,365	5·33	339·15	230	Jr. 2	.. ..	Lancefield Madeira's Chance
Edenhope Queenie ..	66306	10.9.39	11½	6,755	6·09	411·70	250	S. 2	.. ..	Edenhope Masterpiece
§Edenhope Tulip.. ..	61372	24.7.39	4	6,315	5·27	332·94	250	Sr. 2	.. ..	Edenhope Canary's Count
§Five Gums Primrose 3rd	52735	22.7.39	4	5,250	6·32	331·88	350	Mature	.. ..	Werribee Alanda
Rosyth Romany Rose ..	59337	25.7.39	12	5,729	5·97	341·78	330	Sr. 4	.. ..	Werribee Gaypiece
Black, Estate of the Late I. S., Noorat, Ayrshire (5).										
§Mount Noorat Alert 4th	29774	11.8.39	4	6,728	4·43	297·72	330	Sr. 4	343, 308 ..	Scottish Patron of Gowrie Park
Mount Noorat Georgina 8th	30777	22.9.39	21½	9,946	4·50	447·70	270	Jr. 3	341 ..	Mount Noorat Loudon
Mount Noorat Georgina 9th	31640	8.9.39	14	5,754	4.32	248·77	230	Jr. 2	.. ..	Mount Noorat Laurie
Mount Noorat Pyrene 6th	28723	2.9.39	4½	6,563	5·83	382·72	330	Sr. 4	310 ..	Scottish Patron of Gowrie Park
Mount Noorat Pyrene 7th	30779	30.6.39	18½	8,336	4·71	392·22	250	Sr. 2	.. ..	Scottish Patron of Gowrie Park

* 210 days in test. † 210 days in test (sold) ‡ 150 days in test. § 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Broad, Mrs. A. A., Sutton Grange, Jersey (9).										
Grangelea Bunty's Maid ..	66750	23.9.39	16	6,066	5·62	341·08	230	Jr. 2	.. ..	Grangelea Roderick 2nd
Grangelea Cream Belle 3rd	66751	14.9.39	14	5,232	6·14	321·47	230	Jr. 2	.. ..	Grangelea Roderick 2nd
Grangelea Damsel 6th ..	66753	23.9.39	14½	5,403	6·04	326·36	230	Jr. 2	.. ..	Grangelea Roderick 2nd
Grangelea Pretty Primrose 3rd	66759	1.9.39	17	6,246	5·82	363·63	250	Sr. 2	.. ..	Grangelea Daffodil's Airo
Grangelea Regina ..	61944	20.9.39	15½	6,983	5·93	414·17	250	Sr. 2	349 ..	Grangelea Victor 3rd
Grangelea Rose Marie 2nd	66764	13.9.39	14	5,435	5·87	319·06	230	Jr. 2	.. ..	Grangelea Cream Boy
Grangelea Rosebud 7th ..	48527	13.7.39	17	8,022	5·82	467·10	350	Mature	279, 374, 347	Banyule Macon
Grangelea Rosella 3rd ..	48528	27.8.39	18	7,251	6·07	440·06	350	Mature	319, 418, 376, 453	Banyule Macon
Grangelea Ruth	66767	25.9.39	14½	6,366	5·32	338·60	230	Jr. 2	.. ..	Grangelea Roderick 2nd
Bull, S. A., Paschendale, Jersey (3).										
Glen Leigh Dawn 4th ..	61706	6.8.39	N.O.C.	5,546	5·70	316·17	230	Jr. 2	.. ..	Selsey Jupiter
*Glen Leigh Dolly 2nd ..	48266	6.8.39	4	6,015	5·52	332·14	330	Sr. 4	.. ..	Glen Leigh Bounty
Wootong Vale Fanciful ..	65003	14.8.39	N.O.C.	4,472	4·89	218·85	270	Jr. 3	.. ..	Airlie Goldfinder
Butcher, F. T., Murraydale, Red Poll (8).										
Maryville Augusta ..	6205D	18.7.39	15	6,575	3·86	253.81	250	Sr. 2	.. ..	Temperley Prism
Maryville Belle	7116C	3.8.39	19	6,596	3·76	248·20	230	Jr. 2	.. ..	Temperley Prism
Maryville Elain	5048B	13.7.39	9½	7,853	4·24	332·71	330	Sr. 4	273, 326 ..	Chandpara Ferdinand
*Maryville Ella	5898A	24.8.39	4	6,660	4·11	273·80	290	Sr. 3	303, 340 ..	Chandpara Ferdinand
Maryville Jean	6206D	19.8.39	12	8,706	4·43	385·50	290	Sr. 3	250, 350 ..	Chandpara Ferdinand
Maryville Primrose ..	6208D	26.9.39	7½	9,685	4·22	408·68	290	Sr. 3	248 ..	Chandpara Ferdinand
Maryville Rennie ..	6209D	31.8.39	13½	8,201	3·68	301·62	270	Jr. 3	264 ..	Chandpara Ferdinand
Maryville Tulip	6210D	2.9.39	9	7,074	3·87	273·44	270	Jr. 3	271 ..	Temperley Prism
Calf, A. J., Werribee South, Jersey (5).										
Illillouette Master's Countess	67063	1.7.39	15½	5,702	5·98	341·22	230	Jr. 2	.. ..	Finchley Master's Boy
Illillouette Queen Mary ..	C.R.	6.8.39	19	7,782	5·51	428·72	270	Jr. 3	335 ..	Finchley Master's Boy
Kyora Gadget's Twinkle ..	58081	27.8.39	16	6,513	6·15	400·67	330	Sr. 4	323, 322, 363	Gadget (Imp.)
Springvale Countess 2nd ..	46162	26.8.39	19	7,287	5·08	370·13	350	Mature	320, 346, 468, 438, 358	St. Alban's Thelma's King 2nd
Springvale Countess 4th ..	59468	12.9.39	16	6,708	5·56	372·63	350	Mature	315, 407, 435	Leura Choir Boy
Chadderton, J. E., Hamilton, Jersey (3).										
Glen Leigh Dainty 2nd ..	61704	16.7.39	14	6,392	5·50	351·76	230	Jr. 2	.. ..	Selsey Jupiter
Glen Leigh Daphne ..	48263	4.8.39	13½	8,124	5·62	456·40	330	Sr. 4	335, 342, 352	Glen Leigh Bounty
Glen Leigh Destiny 2nd ..	43973	16.8.39	10½	6,801	5·94	404·17	350	Mature	354, 381, 422, 399	Glen Leigh Bounty
Chirnside, R. M., Whittlesea, Jersey (17).										
Mornmoot Clementine 8th	63195	15.9.39	17	6,320	5·25	331·50	230	Jr. 2	.. ..	Werribee Madeira's Ace
Mornmoot Fancy Madeira 6th	58563	23.8.39	29	9,938	5·47	543·87	270	Jr. 3	424 ..	Werribee Madeira's Ace
Mornmoot Fancy Starbright	45256	5.8.39	26	11,684	6·03	704·68	350	Mature	396, 624, 582, 620	Werribee Prince Madeira
Mornmoot Fancy Starbright 2nd	58565	13.9.39	16½	7,289	6·33	461·08	250	Sr. 2	345 ..	Werribee Madeira's Ace
Mornmoot Lotus Flower 2nd	58566	24.8.39	27½	9,366	5·09	476·29	270	Jr. 3	359 ..	Werribee Madeira's Ace
Mornmoot Mimi	58567	31.8.39	22½	9,473	5·72	541·87	250	Sr. 2	413 ..	War Valour (Imp.)
Mornmoot Mimi 2nd ..	63201	19.8.39	18½	6,597	5·38	355·18	230	Jr. 2	.. ..	Werribee Madeira's Ace
Mornmoot Northwood Madeira 2nd	37070	19.7.39	15½	9,909	5·01	499·88	350	Mature	421, 401, 555, 541, 432	Werribee Prince Madeira
Mornmoot Northwood Madeira 6th	58563	18.8.39	21½	9,042	5·59	505·85	270	Jr. 3	372 ..	Werribee Madeira's Ace
Mornmoot Northwood Madeira 7th	63202	11.7.39	12½	6,478	5·46	353·55	230	Jr. 2	.. ..	Werribee Madeira's Ace
Mornmoot Princess Madeira 3rd	45269	7.8.39	27	11,192	5·53	619·19	350	Mature	551, 721, 734, 727	Staghorn Larkspur's Majestic
Mornmoot Princess Madeira 5th	49660	6.9.39	20	8,367	6·41	535·99	350	Mature	429, 571, 555, 539	Werribee Jupiter
Mornmoot Princess Madeira 9th	58569	14.7.39	23	9,840	5·60	551·39	270	Jr. 3	426 ..	Werribee Warrior
Mornmoot Princess Madeira 12th	63203	13.9.39	16	5,774	5·69	328·71	230	Jr. 2	.. ..	Werribee Viceroy
Mornmoot Princess Madeira 14th	63204	6.9.39	17	6,702	5·55	371·77	230	Jr. 2	.. ..	Werribee Warrior
Mornmoot Satisfaction ..	45270	17.8.39	25	10,070	5·21	524·99	350	Mature	370, 519, 492	Werribee Prince Madeira
Mornmoot Satisfaction 5th	63206	24.7.39	17½	5,483	5·82	319·38	230	Jr. 2	.. ..	Werribee Centurion
Clarke, A. B., Glenormiston South, Jersey (1).										
Denniston Blue Bird 4th ..	66208	28.6.39	18½	6,476	5·77	373·41	230	Jr. 2	.. ..	Brucevale Lord Fancy 2nd
Clarke, F. W., Toora, Jersey (7).										
Elanora Lilac 2nd ..	47937	27.8.39	16	7,758	5·59	433·33	350	Mature	354, 449, 521, 505	Burnside Harmony
Mer Vue Butterball ..	67907	13.8.39	11½	4,490	6·38	286·54	250	Sr. 2	360 ..	Berrington Largo
Mer Vue Butterfly ..	67908	13.9.39	17	6,690	6·18	413·49	230	Jr. 2	.. ..	Berrington Largo
Mer Vue Choice 2nd ..	45131	16.9.39	12½	5,915	6·04	357·21	350	Mature	309, 407, 513, 520, 480	Tooravale Silver King
Mer Vue Choice 4th ..	58404	21.9.39	17½	8,453	5·93	501·52	350	Mature	404, 519, 500	Woorayl Flashlight
Mer Vue Cissie 2nd ..	67912	19.7.39	15½	5,622	5·79	325·40	230	Jr. 2	.. ..	Berrington Largo
Mer Vue Sweet Memories..	67914	20.7.39	12	4,580	5·05	272·34	230	Jr. 2	.. ..	Berrington Largo
Clark, P. W., Whittlesea, Jersey (1).										
Coodardy Gloria 10th ..	C.R.	28.6.39	14	5,517	5·49	302·93	250	Sr. 2	.. ..	Staghorn Lord Aldan 3rd

* 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Colenso, L. W. R., Alvie, Jersey (5).										
Maxon Count's Lady 2nd ..	45058	6.9.39	17	7,906	5·46	431·97	350	Mature	315, 342, 295, 383	Maxon Count Graceful
Normandie Alsyke ..	58741	30.6.39	20	6,675	5·58	372·28	290	Sr. 3	188, 165 ..	Normandie Majestic
Normandie Alsyke 2nd ..	68357	8.9.39	18	6,604	5·88	388·48	250	Sr. 2	174 ..	Normandie Majestic
Normandie Ilma 8th ..	68364	29.6.39	12	5,066	5·41	273·97	230	Jr. 2	.. ..	Normandie Majestic
Normandie Thelma 5th ..	58749	15.8.39	20½	7,034	5·69	451·55	290	Sr. 3	181, 169 ..	Normandie Majestic
Coulthard, J. L. and Son, Whittlesea, Jersey (7).										
Walamba Bonette ..	Vol. 27	17.8.39	12	5,356	5·42	290·40	270	Jr. 3	.. ..	Clarendon Eyre Brigadier 3rd
Walamba Boronia's Satisfaction	C.R.	19.7.39	12½	5,446	5·35	291·59	230	Jr. 2	.. ..	Selsey Wonderful Boy
Walamba Broken Dawn ..	C.R.	26.9.39	11	6,145	4·53	278·54	230	Jr. 2	.. ..	Selsey Wonderful Boy
Walamba Bronze Beauty ..	C.R.	11.9.39	15	6,000	5·70	342·22	250	Sr. 2	283 ..	Clarendon Eyre Brigadier 3rd
Walamba Dolly Grey ..	C.R.	26.9.39	8½	5,021	5·16	259·16	230	Jr. 2	.. ..	Selsey Wonderful Boy
Walamba Lady Bird ..	39564	1.9.39	11	4,991	6·27	313·10	290	Sr. 3	195, 259 ..	Clarendon Eyre Brigadier 3rd
Wompini Lady Grey ..	64957	23.8.39	12	5,211	6·33	329·67	290	Sr. 3	294, 268 ..	Wompini Eri King
Crawford, Mrs. E., Traralgon, Jersey (11).										
Balneil Frond	Vol. 27	9.9.39	8	4,262	5·21	221·84	230	Jr. 2	.. ..	Pine Grove Duke
Balneil June Duchess ..	60460	5.9.39	11½	6,245	5·48	342·07	310	Jr. 4	262, 331 ..	Werribee Royal Master
Balneil Leda	Vol. 27	24.9.39	10	5,228	5·00	261·36	230	Jr. 2	.. ..	Werribee War Volunteer
Balneil Miss Fox	60465	15.8.39	11½	5,630	5·63	317·06	310	Jr. 4	241, 313 ..	Riversleigh Fox's Hero
Balneil Princess Madeira ..	Vol. 27	18.9.39	16	5,268	5·10	268·50	230	Jr. 2	.. ..	Werribee War Volunteer
Balneil Sultan's Starbright ..	Vol. 27	29.8.39	7	3,906	5·53	216·16	230	Jr. 2	.. ..	Balneil Island Sultan
Balneil Valley Belle ..	65319	23.7.39	10	7,416	4·68	347·31	250	Sr. 2	264 ..	Werribee War Volunteer
Balneil Valley Moira ..	Vol. 27	19.9.39	10	5,686	4·76	270·84	230	Jr. 2	.. ..	Werribee War Volunteer
Balneil Valley Petal ..	Vol. 27	24.7.39	7	5,874	5·02	294·70	230	Jr. 2	.. ..	Werribee War Volunteer
Balneil Volunteer's Sultane	60469	8.8.39	12½	5,213	5·65	294·40	230	Jr. 2	.. ..	Werribee War Volunteer
Turro Park Eminent's Duchess	33240	11.9.39	14½	8,264	5·53	456·80	350	Mature	376, 409, 475, 445, 395	Aveley Drummer
Daley, Mrs. G. S., Lilydale, Jersey (11).										
Belgonia Design's Empire 2nd	60535	25.9.39	19	6,432	5·12	329·64	270	Jr. 3	284 ..	Belgonia Lady's Duke
Belgonia Design's Empire 3rd	60536	23.9.39	14½	5,684	4·89	278·23	270	Jr. 3	242 ..	Design's Ruler (Imp.)
Belgonia Eileen 2nd ..	42921	6.8.39	31½	12,215	5·70	696·48	350	Mature	427, 561, 620, 621	Duke of the Lake (Imp.)
Belgonia Perree's Girl ..	Vol. 27	22.7.39	15½	5,282	5·62	297·09	230	Jr. 2	.. ..	Aim High (Imp.)
Glen Iris Golden Daisy ..	Vol. 27	16.8.39	7½	3,478	6·81	236·97	230	Jr. 2	.. ..	Design's Golden Oxford (Imp.)
Karrara Perree's Primrose ..	67355	19.8.39	22	7,179	5·85	419·97	230	Jr. 2	.. ..	Springhurst Perree's Quality
Karrara Perree's Tecoma 2nd	Vol. 27	24.9.39	15	5,108	6·31	322·28	250	Sr. 2	.. ..	Springhurst Perree's Quality
Noorat Harmony ..	36911	2.9.39	23	8,169	5·60	457·54	350	Mature	496 ..	Cellist of Warenda
Selsey Clementine's Ricious	69057	10.7.39	16	5,995	6·31	378·18	250	Sr. 2	333 ..	Mornmoot Clementine's King
Selsey Lotus 2nd ..	Vol. 27	25.7.39	17½	6,818	6·19	421·81	250	Sr. 2	.. ..	Brampton Great Boy (Imp.)
Sutton Lea Eline ..	Vol. 27	26.9.39	16	6,423	4·45	285·67	230	Jr. 2	.. ..	Staghorn Prince Aldan
De La Rue, N. C., Weering, Jersey (3).										
*Leura Myrtle 4th ..	40688	10.7.39	..	4,980	4·84	241·00	350	Mature	351 ..	Admiral of Leura
Lucerne Vale Master's Queen 2nd	49247	12.7.39	19	10,101	6·03	609·12	350	Mature	275, 617 ..	Werribee Fancy Masterpiece
Lucerne Vale Nemesia 2nd ..	62829	1.9.39	16½	8,286	5·88	487·50	250	Sr. 2	339 ..	Maxon Masterpiece
Dennis, Mrs. A. A., Frankston, Jersey (1).										
Clarendon Eyre Sweet Lavender 7th	61097	9.9.39	15	5,415	6·44	348·60	250	Sr. 2	.. ..	Rochette's Golden (Imp.)
Department of Agriculture, Burnley, Jersey (2).										
Victoria Flame	51025	2.7.39	16	5,937	6·32	378·48	350	Mature	276, 349, 477	Melrose Lord Essex
*Victoria Viola Lass ..	69540	3.9.39	..	4,155	6·07	252·04	230	Jr. 2	.. ..	Selsey Viola's Boy
Department of Agriculture, Werribee, Friesian (7).										
Victoria Belfry	5104	2.9.39	34½	15,938	3·49	556·66	350	Mature	371, 507, 468	Victoria Joyous Mercedes
Victoria Gaiety ..	4287	21.7.39	15	12,678	3·69	468·15	350	Mature	370, 358, 427, 432	Victoria Topnote
Victoria Illumine ..	Vol. 14	29.7.39	13½	7,485	3·67	274·51	250	Sr. 2	.. ..	Rupertswood Inka Jo
Victoria Inka Domino ..	Vol. 14	9.8.39	15	8,016	4·04	323·70	250	Sr. 2	.. ..	Rupertswood Inka Jo
Victoria Inka Patch ..	Vol. 14	31.7.39	16½	8,066	3·85	310·19	230	Jr. 2	.. ..	Rupertswood Inka Jo
Victoria Sonorita ..	Vol. 14	28.6.39	22	11,957	3·36	401·96	310	Jr. 4	342 ..	Victoria Joyous Mercedes
Victoria Woodcrest Josie ..	Vol. 14	26.7.39	22½	8,322	3·76	312·75	230	Jr. 2	.. ..	Rupertswood Inka Jo
Department of Agriculture, Werribee, Red Poll (14).										
Victoria Agrestis ..	3889A	29.8.39	22	9,785	4·17	407·64	350	Mature	238, 288, 353, 348	Dominion Bright Belgian
Victoria Bursary ..	4884A	5.8.39	11½	5,945	5·02	298·70	350	Mature	265, 309, 319	Dominion Bright Belgian
Victoria Decreet	3902A	25.7.39	9	8,523	4·03	347·40	350	Mature	253, 284, 327	Victoria Iraq
Victoria Grebe	Vol. 11	2.8.39	16	6,045	4·68	282·92	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Hop	6020A	22.8.39	10	10,344	4·12	425·91	310	Jr. 4	331, 399 ..	Woodburn Peter Pan
Victoria Insurgent ..	7013A	4.7.39	16½	8,921	4·47	398·94	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Plum	7020A	17.9.39	12	7,446	4·23	314·81	250	Sr. 2	264 ..	Woodburn Peter Pan
Victoria Sphene	7024A	17.7.39	13	6,425	4·56	292·66	230	Jr. 2	.. ..	Chandpara Valentine
†Victoria Sunrise ..	7025A	15.7.39	4	3,675	4·89	179·54	250	Sr. 2	.. ..	Chandpara Valentine
Victoria Tranquility ..	7026A	6.7.39	13	6,123	4·45	272·65	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Trojan	7027A	7.7.39	14	7,326	5·17	378·93	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Twist	6715AA	20.7.39	9	6,231	4·27	265·77	250	Sr. 2	.. ..	Chandpara Valentine
Victoria Vitamine ..	7029A	30.6.39	..	7,524	4·31	324·02	230	Jr. 2	.. ..	Chandpara Valentine
Victoria Waac	3929A	29.6.39	7	8,862	4·75	421·07	350	Mature	261, 284, 369, 390	Dominion Bright Belgian

* 210 days in test (sold). † 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Dookie Agricultural College, Dookie, Ayrshire (3).										
Dookie Adorn	32241	12.9.39	22½	7866	4·12	323·99	270	Jr. 3	.. ..	Tregorland Indispensible
Dookie Alexandra	32242	20.7.39	19½	7,827	4·16	325·43	270	Jr. 3	.. ..	Dookie Shirley's Boy
Dookie Bebe	32243	20·9.39	25	8,099	4·01	325·09	250	Sr. 2	.. ..	Tregorland Indispensible
Enders, N. H., Stanhope, Jersey (11).										
The Wattles Hazel 2nd ..	55125	22.9.39	12	8,307	5·07	420·94	350	Mature	296, 352, 406	Woodside Chrissy's Gamboge
The Wattles Joy 9th ..	64549	21.9.39	14	8,640	4·42	381·82	270	Jr. 3	341 ..	The Wattles Silver Gamboge
The Wattles Joy 12th ..	69344	24.9.39	14	7,059	5·78	408·10	230	Jr. 2	.. ..	The Wattles Silver Gamboge
The Wattles Myra 8th ..	64553	23.9.39	14	8,538	5·23	446·92	250	Sr. 2	374 ..	The Wattles Silver Gamboge
The Wattles Petal ..	55522	13.8.39	25	8,803	6·04	531·78	330	Sr. 4	437, 480, 571	Banyule Supine
The Wattles Petal 2nd ..	59706	21.7.39	16	6,860	6·61	453·30	290	Sr. 3	337, 398 ..	Selsey Brampton Peer
The Wattles Petal 5th ..	69346	23.9.39	14	7,970	5·43	432·84	230	Jr. 2	.. ..	The Wattles Silver Gamboge
The Wattles Princess 4th	50857	8.9.39	16	8,372	5·62	470·82	350	Mature	403, 448, 480, 504	The Wattles Biplane
The Wattles Silvermine 2nd	55525	26.8.39	13½	8,792	5·84	513·53	350	Mature	373, 453, 502	Woodside Chrissy's Gamboge
The Wattles Silvermine 7th	69349	24.9.39	13	7,694	5·12	393·94	230	Jr. 2	.. ..	Wattles Gold Boy
Selsey, Golden Lily 2nd ..	69061	5.8.39	16	6,513	6·14	399·94	230	Jr. 2	.. ..	Samare's Golden Prince (Imp.)
Fadersen, J. H., Mandurang, Jersey (1).										
Myall Dainty Model ..	45330	28.8.39	7½	7,500	5·17	387·53	350	Mature	330, 329 ..	Kyora Foch
Fairchild and Clutterbuck, Tinambra, Jersey (8).										
Carellen Lady Charm ..	65875	25.9.39	15	6,606	6·26	413·37	230	Jr. 2	.. ..	Darnum Park Lord Starbright
Selsey Champion's Myrtle	Vol. 27	23.9.39	16	6,335	5·24	332·10	230	Jr. 2	.. ..	Brampton Son of Champion's (Imp.)
Selsey Lady Viola 2nd ..	Vol. 27	19 9.39	14	6,374	4·85	309·04	230	Jr. 2	.. ..	Brampton Son of Champion's (Imp.)
Selsey Lotus 3rd ..	Vol. 37	11.9.39	19	6,627	5·14	340·85	230	Jr. 2	.. ..	Brampton Son of Champion's (Imp.)
Vaucluse Clementine ..	59862	2.9.39	14	6,492	5·88	381·51	310	Jr. 4	281, 296 ..	Finchley Lord Clement
Vaucluse Duchess 3rd ..	Vol. 27	8.8.39	16	6,603	5·94	392·05	230	Jr. 2	.. ..	Paisley Master
Vaucluse Marie Rose ..	64739	6.9.39	20	8,145	5·70	463·95	350	Mature	403, 404 ..	Vaucluse Concentration
Vaucluse Tinsel 2nd ..	60524	21.9.39	21	7,353	6·06	445·85	270	Jr. 3	345 ..	Paisley Master
Fixter, A., Boisdale, Guernsey (3).										
Avonview Butter Girl ..	6724	4.8.39	13	5,544	5·62	311·63	230	Jr. 2	.. ..	Kentdale Monogram
Avonview Elaine ..	6728	29.7.39	13½	5.528	5·56	307·42	230	Jr. 2	.. ..	Kentdale Monogram
Avonview June	6730	2.7.39	17½	7,494	5·27	394·75	270	Jr. 3	287 ..	Avonview Sandboy 4th
Foster, A. O., Boisdale, Jersey (8).										
Boisdale Blossom ..	Vol. 27	16.8.39	12½	4,506	6·47	291·49	250	Sr. 2	.. ..	Boisdale Grey Knight
Boisdale Countess 3rd ..	51841	20.9.39	12	7,371	5·51	405·79	330	Sr. 4	224, 296 .	Boisdale Dazzler
Boisdale Gloaming ..	60688	11.9.39	5½	4,387	6·19	271·46	290	Sr. 3	228 ..	Wompini Master Grey
*Boisdale Goldfinch 2nd ..	56433	20.8.39	4	5.110	5·75	293·26	310	Jr. 4	168, 235 ..	Wompini Master Grey
†Boisdale Hazel	51845	16.8.39	4	3,975	4·67	185·64	350	Mature	213, 257 ..	Boisdale Dazzler
Boisdale Princess ..	56434	13.8.39	4	4,741	5·60	265·42	310	Jr. 4	132, 256 ..	Boisdale Dazzler
Boisdale Sweet Girl ..	Vol. 27	20.9.39	4½	2,992	6·05	180·89	250	Sr. 2	.. ..	Boisdale Grey Lord
Pine Park Lady Choice 2nd	41580	5.8.39	4½	5,620	4·63	260·12	350	Mature	341, 318, 383, 303, 229, 259	Goronga Farm Jester
Fraser, G. A., Addington, Ayrshire (6).										
Bonnie Doon Beth ..	28134	1.9.39	25	11,535	4·41	508·38	350	Mature	452, 684 ..	Glengowrie Masterpiece
Bonnie Doon Betty ..	30206	11.8.39	7½	7,036	5·15	362·62	290	Sr. 3	424 ..	Bonnie Doon Baronet
Bonnie Doon Heather Bloom	30209	7.8.39	16	7,563	4·41	333·81	290	Sr. 3	376 ..	Bonnie Doon Baronet
Bonnie Doon Roan ..	30211	3.8.39	7	8,361	4·84	405·04	290	Sr. 3	293 ..	Bonnie Doon Baronet
Bonnie Doon Roma ..	30212	7.9.39	18½	8,446	4·42	373·14	310	Jr. 4	316 ..	Bonnie Doon Baronet
Glengowrie Ray	28468	9.9.39	15½	15,430	5·08	783·40	350	Mature	297, 401, 663, 794, 677	Glengowrie Bold Baron
Gay, R. G. and Son, North Devon, Jersey (6).										
Elm Grove Dawn	52626	19.8.39	17½	9,702	5·62	544·93	350	Mature	304, 347, 376, 403	Gold Star of Melrose
Elm Grove Golden Dawn ..	Vol. 27	24.9.39	16	7,127	5·17	368·57	230	Jr. 2	.. ..	Glen Iris Golden Man
Elm Grove Island Queen ..	61464	13.9.39	17½	7,684	6·31	484·53	310	Jr. 4	281, 340 ..	Werribee Island King
Elm Grove Lady Loch 2nd	52628	21.8.39	19½	8,485	5·12	434·07	350	Mature	313, 339, 359	Gold Star of Melrose
Elm Grove Linda ..	43737	19.8.39	26½	10,766	4·99	537·59	350	Mature	285, 424, 494, 403, 468	Gold Star of Melrose
Mornmoot Satisfaction 4th..	63205	9.7.39	14	6,687	4·56	305·10	230	Jr. 2	.. ..	Werribee Centurion
Goddard, J. H., Cora Lynn, Ayrshire (7).										
Donside Lydo Lady ..	23657	21.9.39	22	15,062	4·97	748·01	350	Mature	457, 622, 672, 480, 610	Olivedale Chum
Inverurie Blue Belle ..	30700	31.8.39	22½	13,241	4·55	601·94	250	Sr. 2	515 ..	Inverurie Laddie
Inverurie Chrissie 2nd ..	31543	21.9.39	6	8,219	4·54	373·41	230	Jr. 2	.. ..	Inverurie Peter
Inverurie Duchess ..	27414	1.9.39	15	8,588	4·47	383·78	350	Mature	401, 399, 354	Oakbank Radio
Inverurie Maggie ..	27417	11.7.39	33	11,657	4.76	555·11	350	Mature	366, 375, 275, 274	Oakbank Radio
Inverurie Meg	30705	28.8.39	10½	9,550	4·50	429·63	310	Jr. 4	271 ..	Inverurie Laddie
Inverurie Rayda	27419	5.8.39	30	11,103	4·61	512·04	350	Mature	393, 289, 529	Oakbank Radio
Grice, C. S., Somerville, Jersey (2).										
Belgonia Suspense 6th ..	56325	26.8.39	13½	8,171	5·89	481·17	310	Jr. 4	413, 478 ..	Design's Ruler (Imp.)
Leven Brae Perree's Girl ..	34002	11.8.39	16	7,188	5·42	389·86	350	Mature	412, 515, 573, 513, 514, 545	Werribee Gaypiece

* 240 days in test. † 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Handbury, J. E. and Son, Toora, No. 1 Farm, Jersey (14).										
Tooravale Bettws-y-Coed 2nd	69402	14.7.39	12	7,452	5·80	432·18	250	Sr. 2	343 ..	Pinewood Aristocrat (Imp.)
Tooravale Lassie 9th ..	42253	14.9.39	19½	6,675	6·10	406·88	350	Mature	294, 344, 338, 413, 469, 474	King's Vale Monica 14th's Son
Tooravale Lassie 29th ..	69405	18.9.39	14	5,503	5·62	309·35	270	Jr. 3	.. ..	Pinewood Aristocrat (Imp.)
Tooravale Lassie 30th ..	Vol. 27	7.8.39	18	6,876	5·85	402·24	230	Jr. 2	.. ..	Pinewood Aristocrat (Imp.)
Tooravale Lassie Fowler 14th	50893	11.9.39	16	7,033	5·93	417·44	350	Mature	311, 441, 497, 472	King's Vale Monica 14th's Son
Tooravale May 7th ..	59765	16.8.39	17½	7,827	4·99	390·24	330	Sr. 4	299, 382, 406	Tooravale Monica's Son
Tooravale Princess 9th ..	46479	20.8.39	21	8,480	5·94	501·05	350	Mature	351, 627, 497, 587, 583, 519	Tooravale Gold Speck
Tooravale Princess 18th ..	59769	3.7.39	16	8,859	6·49	575·23	330	Sr. 4	503, 524 ..	King's Vale Monica 14th's Son
Tooravale Princess 23rd ..	69407	23.8.39	24½	7,691	5·59	429·60	270	Jr. 3	365 ..	Pinewood Aristocrat (Imp.)
Tooravale Princess 24th ..	69408	19 8 39	18½	7,877	5·35	421·33	270	Jr. 3	355 ..	Pinewood Aristocrat (Imp.)
Tooravale Princess 28th ..	Vol. 27	19.7.39	11½	7,073	5·89	416·36	230	Jr. 2	.. ..	Pinewood Aristocrat (Imp.)
Tooravale Princess 29th ..	Vol. 27	7.8.39	12	5,435	5·68	308·84	230	Jr. 2	.. ..	Pinewood Aristocrat (Imp.)
Tooravale Princess 30th ..	Vol. 27	25.7.39	9	5,606	5·08	284·87	230	Jr. 2	.. ..	Pinewood Aristocrat (Imp.)
Tooravale Princess 31st ..	C.R.	29.8.39	12	4,887	5·42	264·71	230	Jr. 2	.. ..	Pinewood Aristocrat (Imp.)
Handley, S. C., Dandenong, Jersey (2).										
Barrowby Rose Fancy ..	56280	13.8.39	18	7,215	5·11	368·61	350	Mature	316, 383, 511, 541	Wompini Twilight
Barrowby Rose Mary ..	65356	8.8.39	27	9,287	5·32	494·39	230	Jr. 2	.. ..	Mornmoot Meteor
Harvey, T., Boisdale, Jersey (3).										
Jerseyholm Empress 58th ..	62313	20.9.39	9½	4,883	5·18	253·02	230	Jr. 2	.. ..	Banyule Biplane
Jerseyholm Kirsty 30th ..	53363	25.7.39	13½	6,089	5·45	332·15	350	Mature	286, 372 ..	Jerseyholm Master's Expert 7th
Jerseyholm Kirsty 39th ..	62317	15.8.39	15½	5,822	5·77	336·07	230	Jr. 2	.. ..	Banyule Biplane
Haywood, Dr. A. R., Hastings, Jersey (11).										
Dalmore Park Princess ..	66161	30.7.39	11	5,328	5·56	296·50	290	Sr. 3	309 ..	Irona Beauvallet
Glen Iris Royal Viola ..	Vol. 27	31.8.39	16½	5,480	5·90	323·17	230	Jr. 2	.. ..	Glen Iris Royal Gallant
St. John's Sapphire 5th ..	Vol. 27	23.7.39	17	6,726	4·40	295·76	230	Jr. 2	.. ..	St. John's Rosebud's Volunteer
Windrest Chevy	42529	20.9.39	10	7,235	5·89	426·50	350	Mature	251, 359, 289, 337, 413, 398	Edmonton Rarius
Windrest Chevy 3rd ..	Vol. 27	11.9.39	14	6,227	6·01	374·27	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Chevy's Dainty ..	Vol. 27	11.9.39	15	6,335	5·63	356·60	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Gay Marie 2nd ..	Vol. 27	14.9.39	17	6,549	6·13	401·64	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Island Goldmine	69733	3.9.39	19	7,542	5·71	430·32	270	Jr. 3	319 ..	Gadget (Imp.)
Windrest Island View ..	Vol. 27	20.9.39	15	7,915	5·23	414·20	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Rose Marie ..	55378	7.9.39	22½	8,756	5·88	514·80	350	Mature	231, 306, 464, 481	Clarendon Eyre Eminent's Achievement
Windrest Twinkle's Adore ..	61939	18.9.39	13½	6,851	6·65	455·75	330	Sr. 4	329, 361	Kyora Hero
Henderson, W., Grasmere, Ayrshire (18).										
Carracoorte Balm 17th ..	27002	28.6.39	7½	7,034	4·45	312·87	350	Mature	318, 225, 259, 309	Carracoorte Gerty's Producer
Carracoorte Balm 25th ..	30254	20.9.39	4	6,207	4·57	283·83	290	Sr. 3	192 ..	Grand View Bernie
Carracoorte Balm 26th ..	32069	7.7.39	7½	5,708	4·37	250·00	250	Sr. 2	.. ..	Carracoorte Boomerang
*Carracoorte Belle 3rd ..	32070	6.8.39	4	4,842	4·88	236·30	230	Jr. 2	.. ..	Carracoorte Boomerang
Carracoorte Bellona 18th ..	28164	3.7.39	6½	8,261	4·16	343·90	350	Mature	241, 208 ..	Carracoorte Panic
Carracoorte Briar Bud 5th ..	30257	21.7.39	19	8,705	4·61	401·68	290	Sr. 3	213 ..	Carracoorte Belle's Victory
†Carracoorte Brownie's Belle	23547	7.9.39	4	6,810	5·19	353·51	350	Mature	260, 355, 390, 483, 338, 355	Carracoorte Gerty's Producer
Carracoorte Bud 9th ..	32074	4.7.39	5½	4,791	4·87	233·48	230	Jr. 2	.. ..	Carracoorte Belle's Victory
Carracoorte Bunty 22nd ..	27006	16.8.39	4	7,077	5·11	361·48	350	Mature	304, 290, 265, 319	Carracoorte Bluebell's Favourite
Carracoorte Bunty 28th ..	30259	27.8.39	5	6,075	4·99	303·42	310	Jr. 4	203 ..	Grand View Bernie
Carracoorte Gerty 12th ..	29208	18.9.39	8½	7,766	4·60	357·20	350	Mature	291, 211, 218, 259	Carracoorte Gerty's Producer
Carracoorte Iris 33rd ..	32076	8.8.39	4	5,225	5·14	268·36	230	Jr. 2	.. ..	Carracoorte Boomerang
‡Carracoorte Palm 4th ..	28176	26.7.39	4	5,730	4·14	237·02	350	Mature	163, 189 ..	Grand View Bernie
§Carracoorte Palm 5th ..	32078	17.9.39	4	5,595	4·43	248·10	330	Sr. 4	.. ..	Carracoorte Gay Lad
Carracoorte Palm 6th ..	32079	4.7.39	5½	6,292	4·59	288·82	270	Jr. 3	.. ..	Grand View Bernie
§Carracoorte Pearl 12th ..	28177	14.9.39	4	5,745	4·90	281·34	350	Mature	.. ..	Grand View Bernie
§Carracoorte Viola 22nd ..	24712	28.7.39	4	6,082	5·04	306·50	350	Mature	251, 304, 224, 297, 271, 278	Carracoorte Pilot
§Carracoorte Viola 26th ..	30266	15.9.39	4	5,190	5·57	289·15	350	Mature	101, 250, 239, 254	Carracoorte Pilot
Higgins, J. A. A., Keysborough, Guernsey (3).										
Hedgevale Delsie ..	7187	13.8.39	4½	5,084	5·57	283·38	230	Jr. 2	.. ..	Melbourne Golden Aristocrat
Melbourne Dorimene ..	5804	25.9.39	11	6,220	5·39	335·12	290	Sr. 3	.. ..	Woodlands Fluer-de-Lys (Imp.)
Melbourne Virginie ..	5900	2.9.39	9	5,937	4·34	257·55	290	Sr. 3	.. ..	Melbourne Golden Power
Hore, E., Leitchville, Jersey (20).										
Milvue Carriad Suspense ..	63097	16.8.39	18½	7,500	4·73	354·79	250	Sr. 2	289 ..	Belgonia Suspense's Design
Milvue Christmas Lily ..	58459	18.9.39	15	5,552	5·86	325·34	310	Jr. 4	..313, 363 ..	Milvue Bettwys Master
Milvue Coronation Chimes ..	67983	20.7.39	15½	6,242	5·38	335·90	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Design's Attraction	67985	1.7.39	13	5,435	5·18	281·35	230	Jr. 2	.. ..	Belgonia Suspense's Design

* 251 days in test. † 210 days in test. ‡ 150 days in test. § 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire
Hore, E., Leitchville, Jersey, (20)—*continued.*										
Milvue Design's Chime ..	63098	4.7.39	17	6,949	5·87	408·03	250	Sr. 2	319 ..	Belgonia Suspense's Design
Milvue Design's Queen ..	67988	2.7.39	14½	5,228	5·15	269·46	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Design's Rosebloom	67990	2.7.39	14	5,102	5·91	301·36	230	Jr. 2	.. ..	Belgonia Suspense's Design
Milvue Honesty	58462	15.9.39	25	8,462	5·19	439·11	310	Jr. 4	313, 363 ..	Clarendon Eyre Eminents Lion 5th
Milvue Larkspur's Attraction	58464	20.7.39	17½	8,903	5·64	502·12	290	Sr. 3	427, 448 ..	Clarendon Eyre Eminents Lion 5th
Milvue Madeira's Coronation	67993	14.8.39	15	6,412	4·88	312·89	230	Jr. 2	234 ..	Belgonia Suspense's Design
Milvue Melys	67994	4.7.39	14½	5,991	5·36	320·96	230	Jr. 2	.. ..	Milvue Mountain Ranger
Milvue Roseleaf	45181	14.7.39	20	8,261	4·80	396·34	350	Mature	388, 426, 411	Taranah Commander
Milvue Roseleaf 2nd ..	58468	19.9.39	25	9,039	5·17	467·09	330	Sr. 4	356, 378 ..	Milvue Christmas Melody
Milvue Tiny Rosebud ..	58469	2.9.39	13	6,617	5·24	346·71	290	Sr. 3	356, 344 ..	Milvue Bettwys Master
Milvue Twylish Bettwys ..	58470	20.7.39	22	9,531	4·97	473·40	350	Mature	367, 382, 432	Milvue Christmas Melody
Tavistock Larkspur ..	55437	13.8.39	20½	9,054	5·75	520·88	350	Mature	433, 501, 492	Werribee Ranger
Tavistock Valerie ..	55444	4.9.39	18½	6,926	5·60	387·99	350	Mature	324, 441, 502, 382	Werribee Ranger
Troed-Yr-Rhiw Bettwys 2nd	42294	8.7.39	24	10,069	5·07	510·46	350	Mature	490, 590, 502, 644	Troed-Yr-Rhiw Masterpiece
Troed-Yr-Rhiw Eastern Queen	59794	17.7.39	18½	7,934	5·40	428·27	330	Sr. 4	355, 403, 422	Clarendon Eyre Oxford Dreamer
Troed-Yr-Rhiw Melys 2nd	64658	2.8.39	21½	8,843	5·06	447·49	350	Mature	296, 419, 428	Troed-Yr-Rhiw Masterpiece
Hore, L. G., Leitchville, Illawarra Shorthorn (12).										
*Hope View Snowdrop ..	20802	2.9.39	4	7,260	3·94	285·77	330	Sr. 4	.. ..	Kimo Nobleman
Horfield Alison	Vol. 7	17.9.39	N.O.C.	6,955	4·50	312·79	290	Sr. 3	.. ..	Hill View Reliance
†Horfield Baby 3rd ..	20809	21.8.39	4	5,917	3.77	223·14	350	Mature	.. ..	Kimo Hero
Horfield Daisy 8th ..	20814	17.9.39	N.O.C.	8,255	3·76	310·19	330	Sr. 4	.. ..	Horfield Acrobat
*Horfield Dora	Vol. 7	4.9.39	4	7,740	3·62	280·33	290	Sr. 3	.. ..	Horfield Acrobat
†Horfield Lottie 2nd ..	20816	7.8.39	4	7,980	3·69	294·22	310	Jr. 4	.. ..	Horfield Acrobat
Horfield Melba 2nd ..	11775	16.9.39	N.O.C.	8,198	3·96	325·05	350	Mature	269 ..	Colmar of Aralabrad
*Horfield Melba 8th ..	20819	1.9.39	4	5,970	4·38	261·42	350	Mature	.. ..	Colmar of Aralabrad
Horfield Rita	11777	26.8.39	N.O.C.	7,530	4·16	313·20	350	Mature	298, 263 ..	Colmar of Aralabrad
†Horfield Silkette ..	20823	4.9.39	4	6,090	3·66	222·91	310	Jr. 4	.. ..	Hill View Reliance
†Horfield Vera 3rd ..	Vol. 7	26.8.39	4	8,385	4·01	335·94	330	Sr. 4	.. ..	Horfield Acrobat
Horfield Viola 3rd ..	Vol. 7	14.9.39	N.O.C.	10,223	3·80	388·06	290	Sr. 3	.. ..	Hill View Reliance
Hore, M. T., Leitchville, Friesian (7).										
‡Elmar Beatrice	C.R.	26.9.39	4	4,485	3·41	153·08	230	Jr. 2	... ..	Burnbank Iona Rock
*Elmar Flo	Vol. 14	11.8.39	4	7,995	3·46	276·89	310	Jr. 4	252 ..	Greenvale Oakwood Posch
Elmar Majoe	C.R.	5.8.39	16½	12,275	3·37	414·21	350	Mature	382 ..	Greenvale Oakwood Posch
Elmar Patricia	Vol. 14	6.8.39	21½	13,670	3·03	420·58	310	Jr. 4	309	Elmar Sylvia's Lad
Elmar Trixie	C.R.	11.8.39	22½	10,433	3·70	385·82	290	Sr. 3	240 ..	Elmar Sylvia's Lad
Elmar Yvonne's Pride ..	C.R.	12.8.39	19½	9,419	3·42	321·83	330	Sr. 4	307 ..	Elmar Sylvia's Lad
Greenvale Flora	App. 2 Vol. 11	12.8.39	20	12,772	3·66	467·21	350	Mature	484, 390, 453, 556	Victoria Double Oak De Kol
Hubbard, A., Yarra Glen, Ayrshire (1).										
Emoh Ruo Laurel 2nd ..	31363	24.9.39	12½	7,057	4·19	295·69	350	Mature	.. ..	Fulham Fun
Huffer, J. A., Gormandale, Jersey (7).										
Glen Valley Coral Sand 6th	Vol. 27	22.8.39	11	4,788	6·03	288·71	230	Jr. 2	.. ..	Glen Valley Mercedes Chief
Glen Valley Handsome Girl 6th	Vol. 27	26.8.39	11¾	4,775	5·95	284·24	230	Jr. 2	.. ..	Glen Valley Mercedes Chief
Glen Valley Mercedes Satisfaction	Vol. 27	9.7.39	12	5,499	5·44	299·38	230	Jr. 2	.. ..	Glen Valley Mercedes Chief
Glen Valley Perree's Fancy	Vol. 27	3.8.39	11	5,478	5·12	280·28	230	Jr. 2	.. ..	Yuleba Fancy Twylish 3rd
Glen Valley Pet	66698	11.9.39	13	6,294	4·82	303·38	270	Jr. 3	248 ..	Glen Valley Sir Roger 2nd
Glen Valley Silvershine ..	52946	19.7.39	13	6,896	5·85	403·25	350	Mature	282, 386, 397, 420, 398, 375	Melrose Ensign
Glen Valley Waverley Lass 8th	Vol. 27	23.7.39	11	6,918	5·67	392·51	230	Jr. 2	.. ..	Brucevale Wyandotte King
Hurrey, Estate Late W. H., Koonwarra, Jersey (7).										
Kooreena Audrey 15th ..	C.R.	15.9.39	13½	5,264	6·40	336·68	230	Jr. 2	.. ..	Kooreena Good Luck
Kooreena Carrie 8th ..	62625	3.8.39	11½	6,680	6·65	444·30	290	Sr. 2	345 ..	Kooreena Mourier's King 2nd
Kooreena Glamour ..	62626	13.8.39	13½	6,519	6·67	434·61	290	Sr. 3	257 ..	Kooreena Carrie 3rd's Halo
Kooreena Maranta 7th ..	40585	9.8.39	16½	7,535	6·04	455·03	350	Mature	313, 402, 471, 458, 435	Columbine's Defiance of Linga Longa
Kooreena Maranta 19th ..	Vol 2.	20.9.39	15	5,597	5·83	326·32	230	Jr. 2	.. ..	Kooreena Good Luck
Kooreena Yo Yo	44759	18.9.39	11	7,614	5.49	417·80	350	Mature	360, 390, 438, 409, 395	Columbine's Defiance of Linga Longa
Kooreena Yo Yo 6th ..	Vol. 27	25.8.39	9½	4,503	6·46	290·84	230	Jr. 2	.. ..	Kooreena Rover 3rd
Hutchison, H. McD., Yan Yean, Jersey (1).										
Eulomo Duchess 3rd ..	57237	13.9.39	13	6,669	7·42	494·91	350	Mature	336, 430 ..	Werribee Lord Fancy
Jackson, H., Lockington, Jersey (5).										
Pine Ridge Countess 3rd ..	68642	16.8.39	21½	8,075	5·55	447·09	250	Sr. 2	358 ..	Duke of The Lake (Imp.)
Pine Ridge Molly ..	63731	15.8.39	18½	8,344	5·64	470·98	290	Sr. 3	285, 408 ..	Duke of The Lake (Imp.)
Pine Ridge Molly 2nd ..	68652	4.9.39	29	9,162	5·43	497·49	270	Jr. 3	443 ..	Duke of The Lake (Imp.)
Pine Ridge Starette 2nd ..	59000	7·8·39	21½	8,105	5·53	448·42	330	Sr. 4	336 ..	Duke of The Lake (Imp.)
Pine Ridge Starette 4th ..	68655	9.8.39	24	8,794	4·70	413·23	230	Jr. 2	.. ..	Duke of The Lake (Imp.)

* 240 days in test. † 210 days in test. ‡ 150 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Jones, A. C., Barnawartha, Illawarra Shorthorn (18).										
Coraldale Cherry 10th ..	16041	3.9.39	N.O.C.	6,138	4·19	257·47	350	Mature	.. ..	Berry Ignatius
*Coraldale Damsel 7th ..	16045	24.9.39	4	5,220	3·43	178·89	350	Mature	.. ..	Berry Ignatius
Coraldale Damsel 12th ..	Vol. 7	12.9.39	8½	4,616	4·22	194·87	250	Sr. 2	.. ..	Berry Ignatius
Coraldale Doris 6th ..	Vol. 7	30.8.39	N.O.C.	6,594	3·73	245·74	350	Mature	.. ..	Berry Ignatius
Coraldale Fussy 6th ..	16046	1.9.39	4½	5,549	4·49	248·90	350	Mature	.. ..	Berry Ignatius
Coraldale Melba 7th ..	Vol. 7	2.9.39	4	5,067	3·62	183·51	250	Sr. 2	.. ..	Sunnyvale David
Coraldale Melba 8th ..	Vol. 7	22.8.39	10½	5,642	3·75	211·54	250	Sr. 2	.. ..	Sunnyvale David
Coraldale Scarlet 13th ..	C.R.	30.8.39	10½	6,126	3·78	231·35	250	Sr. 2	.. ..	Sunnyvale David
Coraldale Scarlet 14th ..	Vol. 7	23.8.39	13½	5,306	4·01	212·68	230	Jr. 2	.. ..	Sunnyvale David
Hillview Jewel 2nd ..	Vol. 7	24.8.39	10½	6,430	3·71	238·82	350	Mature	324 ..	Limelight of Hillview
Raleigh Ethel 38th ..	22059	9.8.39	N.O.C.	9,506	3·68	350·01	350	Mature	.. ..	Royal Standard of Darbalara
The Forest Belle 8th ..	14538	26.9.39	13	8,806	4·01	352·86	350	Mature	257 ..	Despatch of the Forest
The Forest Marjorie 3rd ..	6601	26.8.39	9½	7,244	4·25	307·85	350	Mature	.. ..	Renown of Mayfield
Wangoola Buttercup 2nd ..	Vol. 7	15.9.39	13½	5,786	4·63	267·86	250	Sr. 2	.. ..	Wangoola Rose's Discovery
Wangoola Cherry 2nd ..	Vol. 7	19.7.39	N.O.C.	5,097	3·57	214·30	310	Jr. 4	.. ..	The Forest Livingstone
Wangoola Gold	Vol. 7	23.9.39	11½	7,550	3·65	275·41	230	Jr. 2	.. ..	Hillview Renown
Wangoola Silvermine's Belle	C.R.	25.9.39	9	6,822	3·68	251·09	270	Jr. 3	.. ..	The Forest Silvermine
Wangoola Venus 2nd ..	Vol. 7	26.9.39	11	6,423	4·18	268·60	270	Jr. 3	.. ..	Hillview Renown
Leask, G. C., Garfield, Ayrshire (5).										
Burghclere Iona Dulcie ..	C.R.	18.7.39	10	5,136	4·35	223·55	230	Jr. 2	.. ..	Gowrie Park Bonnie Jock
Burghclere Iris	30222	11.8.39	7½	6,106	4·03	246·34	290	Sr. 3	287, 170 ..	Wayside Wilfred
Glen View Nessie 9th ..	30600	25.9.39	10	8,621	4·00	345·08	350	Mature	253, 203 ..	Glen View Standish
Wayside Constance ..	28945	17.8.39	15	9,393	3·84	360·63	350	Mature	345, 354, 315	Wayside Winsome's Scott
Wayside Dahlia	30992	13.7.39	10½	6,191	4·21	260·41	330	Sr. 4	317, 291 ..	Gowrie Park Great Scott
Le Noury, E., Werribee South, Guernsey (4).										
Melbourne Bellbird ..	3624	14.7.39	14	6,957	4·18	290·79	350	Mature	.. ..	Melbourne Sandboy
Werribee Model Maid ..	8089	18.7.39	14	6,854	4·55	311·54	270	Jr. 3	274 ..	Werribee Prince Don
Werribee Souvenir ..	8091	3.7.39	17	7,341	4·78	351·18	250	Sr. 2	274 ..	Yarraview Commander
*Werribee Sweet Memory..	8092	15.8.39	4	3,825	4·49	171·92	230	Jr. 2	.. ..	Werribee Prince Don
Longerenong Agricultural College, Dooen, Ayrshire (2).										
Longerenong Laurustine 2nd	26560	14.9.39	9	7,448	4·10	305·47	350	Mature	221, 306, 323, 246	Longerenong Noble
Longerenong Silver Wattle 4th	30762	24.8.39	7	5,756	4·25	244·44	250	Sr. 2	189 ..	Dookie Punch
Lyon, C. G., Heidelberg, Jersey (1).										
Banyule Molly 56th ..	56255	10.9.39	17	5,766	6·55	377·42	270	Jr. 3	.. ..	Banyule Triplane
Macauley, C. W., Rochester, Jersey (9).										
Taranah Chime 2nd ..	Vol. 27	26.9.39	9½	4,934	5·82	287·56	230	Jr. 2	.. ..	Taranah Reliance
Taranah Dahlia 3rd ..	69221	9.8.39	15	6,022	6·15	370·16	290	Sr. 3	319, 390 ..	Taranah Reliance
Taranah Fair Lady 3rd ..	69222	7·9·39	13½	6,341	6·05	383·71	270	Jr. 3	359 ..	Werribee Bluebell's Masterpiece
Taranah Flora 2nd ..	59633	30.7.39	20	9,443	5·52	521·13	330	Sr. 4	340, 374, 397	Taranah Commander
Taranah Flora 3rd ..	69223	22.7.39	20	7,212	5·76	415·51	250	Sr. 2	351 ..	Taranah Fair Boy
Taranah Flora 4th ..	Vol. 27	9.8.39	16½	5,660	6·44	364·69	230	Jr. 2	.. ..	Taranah Champion
Taranah Floss 4th ..	Vol. 27	18.9.39	14	5,846	5·48	320·41	230	Jr. 2	.. ..	Werribee Bluebell's Masterpiece
Taranah Rainbow 2nd ..	64463	8.8 39	16	8,732	5·90	514·86	290	Sr. 3	286, 380 ..	Werribee Bluebell's Masterpiece
Taranah Rainbow 4th ..	Vol. 27	8.8.39	16	6,612	5·50	363·70	230	Jr. 2	.. ..	Taranah Champion
McCosh, S. J., Wandin North, Jersey (2).										
Heathermont Modesty ..	53157	3.7.39	13½	6,661	5·43	361·53	330	Sr. 4	228 ..	Werribee Madeira's Ace
Heathermont Modesty's Miss	C.R.	4.9.39	12	6,136	4·69	287·54	230	Jr. 2	.. ..	Glen Valley Masterman
McErvale, I. and Sons, Camperdown, Jersey (11).										
Cumnock Bright Jewel ..	47850	20.8.39	8½	6,894	4·56	314·36	350	Mature	451 ..	Cumnock Fancy Masterpiece
Cumnock Grace	C.R.	26.8.39	11	5,349	5·65	302·32	250	Sr. 2	207 ..	Cumnock Governor General
Cumnock Lady Grey ..	C.R.	20.7.39	13	4,473	5·12	229·20	230	Jr. 2	.. ..	Staghorn Prince Clementine
Cumnock Lone Girl ..	47853	20.7.39	12	6,765	4·84	327·57	350	Mature	339, 313, 283	Cumnock Fancy Masterpiece
Cumnock Marigold ..	61244	25.8.39	15	7,174	4·65	333·43	350	Mature	283, 195 ..	Cumnock Fancy Masterpiece
Cumnock Pansy	66128	23·8·39	12½	5,726	5·21	298·38	250	Sr. 2	209 ..	Cumnock Governor General
Cumnock Radiant ..	66129	22.7.39	15	5,168	5·55	286·82	310	Jr. 4	213 ..	Cumnock Fancy Masterpiece
Cumnock Streamline ..	61245	24.8.39	12	5,376	6·63	356·21	270	Jr. 3	.. ..	Airlie Golden Lad
Cumnock Sylvia ..	57029	24.7.39	13	5,741	5·22	299·92	350	Mature	249 ..	Cumnock Fancy Masterpiece
Greenwood Keyhole ..	62003	11.9.39	18½	7,151	4·82	344·37	310	Jr. 4	.. ..	Greenwood Geoff
Lauriston Bluebell 3rd ..	40636	28.7.39	11	5,628	5·03	283·17	350	Mature	290, 253 ..	Lauriston Twylish Nobility
McNabb, G. A. and Son, Irrewillipe East, Jersey (25).										
Avalon Madeira's Pansy 8th	65236	29.7.39	17	6,976	4·96	345·85	230	Jr. 2	.. ..	Mornmoot Prince Madeira
Maxon Bright Clara ..	54013	5.8.39	18	7,495	6·02	451·26	330	Sr. 4	315, 358, 303	Maxon Starbright Prince 5th
Maxon Bright Favourite ..	45055	22.8.39	23	11,321	5·35	605·15	350	Mature	337, 342, 428, 418, 294	Maxon Starbright Prince 5th
Maxon Chieftain's Alsyke..	49422	6.8.39	15	6,091	6·74	410·67	350	Mature	188, 282, 304, 275	Maxon Chieftain
Maxon Chieftain's Light ..	58346	9.9.39	23	8,552	6·15	526·33	310	Jr. 4	283, 322 ..	Maxon Chieftain
Maxon Countess Light ..	49425	10.9.39	35½	12,100	6·07	734·98	350	Mature	331, 390, 427, 372	Maxon Count Graceful
Maxon Count's Alsyke 4th	58348	2.8.39	17	6,545	6·52	426·69	290	Sr. 3	331, 259 ..	Maxon Count Graceful

* 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields at Butter Fat.	Sire.
McNabb, G. A. and Son, Irrewillipe East, Jersey—*continued.*										
Maxon Count's Alsyke 6th	62995	12.9.39	12	4,295	6·55	281·16	250	Sr. 2	149 ..	Maxon Count Graceful
Maxon Count's Daisy 2nd	54017	6.9.39	13	6,463	6·50	420·14	330	Sr. 4	245, 293, 328	Maxon Count Graceful
Maxon Count's Daisy 3rd..	58349	1.8.39	12	5,082	6·95	353·42	290	Sr. 3	284, 298 ..	Maxon Count Graceful
Maxon Count's Daisy 5th..	62998	4.9.39	22	7,512	6·50	488·17	270	Jr. 3	.. ..	Maxon Count Graceful
Maxon Count's Favourite 2nd	49423	21.9.39	22½	7,523	5·72	430·80	350	Mature	227, 280, 338, 291	Maxon Count Graceful
Maxon Count's Favourite 3rd	58351	14.9.39	17	7,054	5·81	409·87	290	Sr. 3	277, 266 ..	Maxon Count Graceful
Maxon Count's Favourite 4th	62999	12.9.39	13½	5,592	6·90	385·84	250	Sr. 2	231 ..	Maxon Count Graceful
Maxon Count's Lodestone 2nd	54020	11.9.39	17	8,685	6·00	521·50	350	Mature	339, 339, 256	Maxon Count Graceful
Maxon Count's Marie ..	49424	7.9.39	22½	8,694	5·80	504·31	350	Mature	210, 331, 313, 314	Maxon Count Graceful
Maxon Count's Ranunculus 2nd	58353	13.9.39	18	6,330	6·89	436 43	310	Jr. 4	319, 272 ..	Maxon Count Graceful
Maxon Graceful Bouvardia	49426	1.9.39	17	6,654	6·85	456·06	350	Mature	252, 328, 439, 337	Maxon Count Graceful
Maxon Graceful Duchess 2nd	49427	3.9.39	13½	7,055	6·78	478·29	350	Mature	282, 392, 374, 289	Maxon Count Graceful
Maxon Linnacre's Estelle..	63005	31.8.39	14	5,579	6·30	351·71	250	Sr. 2	185 ..	Maxon Linnacre's Starbright 2nd
Maxon Mercedes' Ranunculus	45067	12.9.39	19	6,673	5·90	393·71	350	Mature	332, 283, 356, 384, 323	Maxon Mercedes' Chief 4th
Maxon Noble's Buttercup ..	45068	6.8.39	20	8,893	5·96	530·35	350	Mature	338, 430, 422	Avalon Noble 8th
Maxon Noble's Lodie 2nd..	58357	7.8.39	18	7,420	5·78	428·75	310	Jr. 4	310, 259 ..	Avalon Noble 8th
Maxon Silver Light ..	58358	1.8.39	15	6,077	6·75	410·33	290	Sr. 3	304, 295 ..	Maxon Count Graceful
Maxon Sweet Estelle ..	54029	13.9.39	15	7,859	6·21	488·17	330	Sr. 4	285, 397, 326	Maxon Count Graceful
Maher, R. H., Tongala, Jersey (22).										
Rosemont Daisy 6th ..	68953	5.7.39	11	6,241	5·70	355·46	290	Sr. 3	241 ..	Rosemont Golden Emblem
Rosemont Daisy 7th ..	Vol. 27	4.8.39	14	5,601	5·81	325·27	250	Sr. 2	.. ..	Rosemont Laddie Fowler 3rd
Rosemont Duchess Fowler	59283	27.8.39	8½	4,873	6·04	294·28	330	Sr. 4	339 ..	Rosemont Golden Emblem
Rosemont Duchess Fowler 2nd	Vol. 27	9.8.39	13½	6,338	4·94	313·40	250	Sr. 2	.. ..	Rosemont Volunteer
Rosemont Jenny Lind 10th	55080	13.9.39	10½	4,472	5·46	244·15	350	Mature	224, 346, 316, 283	Rosemont Laddie Fowler 3rd
Rosemont Jenny Lind 12th	64056	15.7.39	12	5,286	6·48	342·72	290	Sr. 3	264 ..	Rosemont Golden Emblem
Rosemont Jenny Lind 14th	Vol. 27	4.8.39	13½	5,204	5·00	260·35	250	Sr. 2	.. ..	Rosemont Volunteer
Rosemont Lady Fowler 10th	55081	8.9.39	10½	5,069	5·59	283·43	350	Mature	204, 239 ..	Rosemont Laddie Fowler 3rd
Rosemont Lady Fowler 17th	64060	16.7.39	15½	6,710	5·68	381·10	290	Sr. 3	231 ..	Rosemont Defence
Rosemont Lady Fowler 18th	Vol. 27	4.8.39	13½	5,007	5·20	260·39	250	Sr. 2	.. ..	Rosemont Laddie Fowler 3rd
Rosemont Lady Fowler 19th	Vol. 27	12.8.39	10	4,934	5·12	252·39	250	Sr. 2	.. ..	Rosemont Volunteer
Rosemont Lassie Fowler 11th	59288	9.9.39	9½	6,307	5·54	349·20	350	Mature	237, 319 ..	Rosemont Golden Emblem
Rosemont Lassie Fowler 13th	64062	16.7.39	8½	4,887	5·11	249·72	290	Sr. 3	202 ..	Rosemont Laddie Fowler 3rd
Rosemont Lassie Fowler 15th	Vol. 27	16.7.39	7	4,113	5·64	232·00	250	Sr. 2	.. ..	Rosemont Golden Emblem
Rosemont Laura 7th ..	50461	19.8.39	8	5,299	5·36	283·95	350	Mature	247, 311, 315	Rosemont Laddie Fowler 3rd
Rosemont Laura 9th ..	64064	20.8.39	6	5,556	5·24	291·07	290	Sr. 3	190 ..	Rosemont Laddie Fowler 3rd
Rosemont Primrose 6th ..	64065	12.9.39	16	8,373	5·08	425·62	330	Sr. 4	339, 403 ..	Rosemont Laddie Fowler 3rd
Rosemont Primrose 7th ..	Vol. 27	1.7.39	15½	6,316	5·41	341·18	250	Sr. 2	.. ..	Rosemont Laddie Fowler 3rd
*Rosemont Silvermine 8th	64068	15.9.39	4	2,205	4·91	108·16	290	Sr. 3	204 ..	Rosemont Golden Emblem
Rosemont Silvermine 9th ..	64069	14.7.39	13½	5,510	5·53	306·29	290	Sr. 3	293 ..	Rosemont Laddie Fowler 3rd
Rosemont Silvermine 10th	Vol. 27	23.7.39	12	5,211	5·84	304·35	250	Sr. 2	.. ..	Rosemont Laddie Fowler 3rd
Rosemont Silvermine 11th	Vol. 27	8.8.39	13½	5,855	5·66	331·24	250	Sr. 2	.. ..	Rosemont Laddie Fowler 3rd
Maloney, P. J., Tongala, Jersey (11).										
Belgonia Design's Eileen ..	51698	30.8.39	23	8,949	5·96	533·79	350	Mature	397, 477, 516	Design's Ruler (Imp.)
Belgonia Design's Eileen 2nd	Vol. 27	30.7.39	23	8,606	5·52	474·67	250	Sr. 2	.. ..	Duke of The Lake (Imp.)
Belgonia Design's Marie 2nd	51700	19.8.39	8	7,422	4·91	364·06	350	Mature	392, 392, 463	Design's Ruler (Imp.)
Belgonia Duke's Buttercup 2nd	56318	18.8.39	17	8,943	5·15	460·27	290	Sr. 3	349, 445 ..	Design's Ruler (Imp.)
Belgonia Empire 2nd ..	Vol. 27	8.9.39	19	8,145	4·81	391·45	230	Jr. 2	.. ..	Aim High (Imp.)
Belgonia Junette 3rd ..	56321	14.9.39	11	10,079	5·67	571·89	310	Jr. 4	426, 473 ..	Design's Ruler (Imp.)
Belgonia Junette 5th ..	60541	4.9.39	14	8,357	5·67	474·07	250	Sr. 2	424 ..	Design's Ruler (Imp.)
Belgonia Peggy 16th ..	Vol. 27	11.9.39	10	5,474	5·78	316·36	270	Jr. 3	.. ..	Design's Ruler (Imp.)
Belgonia Peggy 18th ..	60543	12.9.39	16	7,668	4·61	355·91	250	Sr. 2	316 ..	Design's Ruler (Imp.)
Belgonia Peggy 19th ..	Vol. 27	6.9.39	9½	7,148	5·22	373·30	230	Jr. 2	.. ..	Aim High (Imp.)
Belgonia Peggy 20th ..	Vol. 27	2.9.39	16	8,726	4·87	425·03	230	Jr. 2	.. ..	Aim High (Imp.)
Manly, R. A. A., Ventnor, Dairy Shorthorn (1).										
Braelands Princess Rose 16th	Vol. 2	21.8.39	14½	8,303	4·42	367·26	290	Sr. 3	.. ..	Morven Lord Cressida 4th

* 90 days in test.

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Masters, S. H. and Son, Murraydale, Jersey (11).										
Rutland Bright Stockings 3rd	69024	2.8.39	19	7,364	5·95	437·98	270	Jr. 3	363 ..	King's Vale Lauder
Rutland Bright Stockings 4th	69025	14.7.39	16	5,601	6·23	348·73	230	Jr. 2	.. ..	King's Vale Lauder
Rutland Brunette 6th ..	50524	18.8.39	16	6,572	5·54	363·90	350	Mature	292, 405, 382, 407, 404	Rutland Rover
Rutland Brunette 10th ..	59354	20.8.39	28	9,567	5·16	493·56	350	Mature	335, 384, 454	King's Vale Lauder
Rutland Brunette 12th ..	59356	2.9.39	23	8,703	5·24	456·39	350	Mature	316, 373, 394	King's Vale Lauder
Rutland Brunette 13th ..	59357	20.9.39	16	7,748	5·34	413·73	350	Mature	305, 395, 426	King's Vale Lauder
Rutland Brunette 15th ..	64152	8.9.39	22½	8,892	5·19	461·38	310	Jr. 4	298, 395 ..	King's Vale Lauder
Rutland Brunette 16th ..	64153	12.9.39	27	9,762	5·33	520·80	310	Jr. 4	363, 454 ..	King's Vale Lauder
Rutland Brunette 18th ..	69026	12.7 39	17½	6,642	5·12	339·87	230	Jr. 2	.. ..	King's Vale Lauder
Rutland Brunette 19th ..	69027	6.8.39	18	5,768	5·34	308·06	230	Jr. 2	.. ..	Rutland Patch
Rutland Brunette 20th ..	69028	2.8.39	17½	6,335	6·16	390·09	230	Jr. 2	.. ..	Selsey Fashion Boy
Meaklim Bros., Mooroopna, Dairy Shorthorn (2).										
Drumneil Lily 2nd ..	Vol. 2	18.8.39	33	11,532	4·13	476·15	290	Sr. 3	322 ..	Willow Park Lustre 3rd
Drumneil Princess 2nd ..	783E	28.8.39	21	10,050	3·80	382·34	350	Mature	.. ..	Willow Park Reformer
Medland, F., Shepparton, Jersey (1).										
*Maneroo Lillian ..	49370	20.7.39	..	6,615	5·50	363·51	350	Mature	.. ..	Maneroo Daphne's Twylish Lad
Mesley, W. T., Dalyston, Jersey (1).										
†Warenda Agnes 8th ..	64810	30.8.39	..	4,275	6·92	295·69	270	Jr. 3	.. ..	Riverbank Royal Exchange
Mitchell, R. H., Linton, Jersey (3).										
Clifford Farm Gladsome ..	32965	10.7.39	28	11,354	6·32	718·06	350	Mature	411, 465, 472, 367, 454	Clifford Farm Eliminator
Clifford Farm Joyous Melody	52272	19.7.39	21½	9,155	5·89	539·33	350	Mature	379, 408, 459	Wompini V.C.
Clifford Farm Misty Maiden	52273	9.7.39	9½	7,748	5·71	442·71	350	Mature	299, 391, 424	Clifford Farm Chieftain
Moore, J. and Co., Hedley, Jersey (18).										
‡Antimony's Trixie of Belle Vue	15569	14.8.39	4	4,612	4·93	227·24	350	Mature	479, 460, 463, 415, 472, 351, 363	Columbine's Antimony
§Belgonia Suspense 9th ..	Vol. 27	19.9.39	4	2,340	4·80	112·29	230	Jr. 2	.. ..	Aim High (Imp.)
Clarendon Eyre Belladonna 8th	56797	1.9.39	6½	5,916	5·61	335·28	330	Sr. 4	274, 316 ..	Clarendon Eyre Oxford Observer
Clarendon Eyre Camille 14th	61035	5.7.39	4½	4,619	4·83	222·94	290	Sr. 3	208 ..	Rochette's Golden (Imp.)
‖Clarendon Eyre Rose Marie 14th	56810	12.7.39	4	2,025	5·12	103·61	290	Sr. 3	247 ..	Clarendon Eyre Oxford's Gamboge 2nd
Rydon Belle	41920	20.7.39	10	5,403	4·93	266·42	350	Mature	347, 400, 355, 345, 350	Melrose Migrant
Tooloonook Camille ..	C.R.	22.8.39	9½	4,829	5·65	272·83	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Heather 8th ..	Vol. 27	1.9.39	8	4,802	4·66	223·72	230	Jr. 2	.. ..	Belgonia Lady's Duke
§Tooloonook Lilac Bloom..	33542	10.8.39	4	3,150	4·72	148·58	350	Mature	263, 342, 355, 265, 287, 307, 326, 222	Heroic of Somerville
Tooloonook Molly 15th ..	C.R.	17.7.39	6½	5,486	5·69	311·95	250	Sr. 2	.. ..	Latrobe Musician
Tooloonook Peach ..	33545	21.9.39	5	7,280	4·36	317·76	350	Mature	282, 358, 338, 384, 411, 432, 444, 400	Tooloonook Carob's Hero
Tooloonook Peach 4th ..	46471	1.7.39	9½	6,629	4·44	294·27	350	Mature	236, 256, 273, 296	Heroic of Somerville
Tooloonook Plumbago 9th	Vol. 27	1.7.39	7½	4,478	6·15	275·56	250	Sr. 2	.. ..	Latrobe Musician
Tooloonook Polygold ..	64601	4.9.39	8	7,686	4·54	349·30	350	Mature	305, 277, 380, 401	Tooloonook Clianthus Hero
Tooloonook Rose.. ..	C.R.	21.9.39	10½	5,964	5·42	323·08	250	Sr. 2	.. ..	Belgonia Lady's Duke
§Tooloonook Trixie 6th ..	33549	4.7.39	4	3,960	5·17	204·57	350	Mature	208, 401, 281, 174, 326, 307, 266	Heroic of Somerville
Tooloonook Trixie 24th ..	Vol. 27	14.9.39	8	4,892	5·20	254·46	230	Jr. 2	.. ..	Belgonia Lady's Duke
Tooloonook Verbena 9th ..	64604	24.8.39	4	6,324	5·57	352·41	310	Jr. 4	296, 282 ..	Anfield Diadem's Masterpiece
Murdoch, J. and Son, Lismore, Jersey (5).										
Ismalia Countess ..	62229	25.8.39	12½	6,602	5·37	354·43	270	Jr. 3	233 ..	Orphanage Mabel's Chief
Ismalia Countess 2nd ..	67120	24.9.39	15½	5,278	5·54	292·54	230	Jr. 2	.. ..	Retford King Bracken
Ismalia Garenne	57781	24.8.39	10½	6,031	5·24	318·76	290	Sr. 3	282, 292 ..	Orphanage Molly's Thorn
Ismalia Petal 2nd ..	62230	19.9.39	14½	6,350	5·13	325·56	310	Jr. 4	292, 242 ..	Murona Twylair
Murona Garenne	54325	29.8.39	8	6,534	5·54	362·15	350	Mature	312, 382, 309	Banyule Airpoise
Nancarrow Bros., Kerang, Jersey (6).										
Pine Ridge Design's Buttercup	68643	16.9.39	17½	5,777	5·47	315·88	230	Jr. 2	.. ..	Aim High (Imp.)
Pine Ridge Duke's Silvermine	68649	24.9.39	23	8,482	5·57	472·26	250	Sr. 2	371 ..	Duke of The Lake (Imp.)
Pine Ridge Hawthorn 2nd	63730	1.9.39	25	10,104	4·90	494·80	310	Jr. 4	296, 432 ..	Duke of The Lake (Imp.)
Pine Ridge Lady ..	68651	2.9.39	18	9,720	5·16	501·86	250	Sr. 2	427 ..	Duke of The Lake (Imp.)
Pine Ridge Molly 3rd ..	68653	7.8.39	16½	6,260	6·04	378·00	230	Jr. 2	.. ..	Duke of The Lake (Imp.)
Pine Ridge Silvermine 2nd	58999	3.8.39	12	9,434	4·91	463·07	330	Sr. 4	315, 334, 431	Duke of The Lake (Imp.)

* 180 days in test (herd withdrawn). † 210 days in test (herd withdrawn). ‡ 240 days in test.
§ 210 days in test. ‖ 180 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Nicholas, M. A., Sherbrooke, Jersey (12).										
Brampton Champion's Pansy (Imp.)	56043	25.8.39	7	6,006	5·22	313·43	310	Jr. 4	216, 206 ..	Brampton Son of Champions
Brampton Standard Nelly (Imp.)	56050	30.7.39	15	5,643	5·79	326·65	310	Jr. 4	285, 314 ..	Brampton Sporting Standard
Selsey Great Clementine ..	64220	1.8.39	11	4,804	7·28	349·90	270	Jr. 3	338 ..	Brampton Great Boy (Imp.)
Selsey Jersey Lily ..	64221	26.8.39	22	7,370	5·74	423·29	270	Jr. 3	380 ..	Selsey Brampton Boy
Selsey Jersey Lily 2nd ..	69063	4.8.39	24	7,487	5·71	427·53	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)
Selsey Maple 3rd ..	59412	9.8.39	22	7,901	5·08	401·57	310	Jr. 4	296, 353 ..	Brampton Great Boy (Imp.)
Selsey Pansy	69065	8.9.39	21½	7,011	5·34	374·51	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)
Selsey Ranunculus 2nd ..	69066	2.7.39	15½	6,467	5·40	349·16	230	Jr. 2	.. ..	Brampton Sporting Standard (Imp.)
Selsey Samares Starbright	69070	19.9.39	21½	6,656	5·46	363·40	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)
Selsey Waterlily 4th ..	69074	29.8.39	21½	6,444	5·60	361·06	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)
Selsey Weigelia	55214	7.9.39	13½	6,041	5·93	358·29	350	Mature	295, 310, 404	Brampton Great Boy (Imp.)
Selsey Wyandotte ..	41949	16.8.39	18	7,119	6·91	492·11	350	Mature	319, 474, 430, 522, 470	Werribee Wyandotte's King
Noble, T. M. and Sons, Maffra, Jersey (11).										
Finchley Bluebell ..	57277	11.7.39	20½	9,242	6·23	575·94	330	Sr. 4	352, 392 ..	Werribee Lord Burnham
Finchley Handsome Lady..	37993	19.8.39	20	7,410	7·36	545·60	350	Mature	420, 439, 652, 586, 582, 543	Werribee Lord Burnham
Finchley Lady Burnham ..	48129	17.9.39	10½	5,162	6·96	359·16	350	Mature	328, 384, 436	Werribee Lord Burnham
Finchley Lady Peerless 2nd	57278	8.7.39	19½	7,589	6·33	480·45	310	Jr. 4	352, 394 ..	Finchley Lord Harmony
Finchley Master's Bluebell	66460	21.7.39	21½	8,495	5·57	473·18	230	Jr. 2	.. ..	Finchley Masterman
Finchley Nasturtium 5th ..	61613	15.7.39	20½	8,420	6·60	555·03	270	Jr. 3	451 ..	Werribee Lord Burnham
Finchley Nasturtium 6th ..	61614	6.9.39	15	6,420	7·21	462·73	270	Jr. 3	356 ..	Finchley Masterman
Finchley Speck	61615	23.9.39	25½	7,373	6·16	454·02	250	Sr. 2	398 ..	Werribee Lord Burnham
Linga Longa Wattle Speck	25574	15.9.39	21½	8,480	5·48	464·82	350	Mature	317, 373, 410, 492, 558, 468, 480, 499, 521, 450, 447	Canary's Handsome Boy of Linga Longa
Selsey Fernleaf 2nd ..	69060	17.8.39	17½	7,260	5·40	391·83	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)
Selsey Free Girl ..	65061	20.8.39	15½	6,962	6·51	453·22	250	Sr. 2	234 ..	Wonderful Standard 2nd
Norman, J. G., Pennyroyal, Jersey (23).										
Banaview Clementine ..	60475	13.7.39	8	6,249	5·70	356·18	290	Sr. 3	301, 347 ..	Banyarra Nova
*Banaview Clementine 3rd	65325	16.8.39	..	4,800	5·46	262·12	230	Jr. 2	.. ..	Banaview Design's Master
Banaview Daffodil ..	60476	20.7.39	..	6,785	4·83	327·71	290	Sr. 3	306, 343 ..	Banyarra Nova
†Banaview Daffodil 2nd ..	65327	22.8.39	..	5,895	4·97	293·09	230	Jr. 2	.. ..	Banaview Design's Master
†Banaview Design ..	Vol. 27	12.8.39	..	6,450	4·85	312·53	290	Sr. 3	279, 317 ..	Banyarra Nova
Banaview Design 2nd ..	65328	20.7.39	..	7,542	4·85	365·46	250	Sr. 2	278 ..	Banaview Silvermine's Sultan
*Banaview Design 3rd ..	65329	19.9.39	..	5,310	4·72	250·89	230	Jr. 2	.. ..	Banaview Silvermine's Sultan
Banaview Jonquil ..	47104	18.7.39	..	8,183	4·81	393·70	350	Mature	335, 387, 430, 455	Kantara Starbright's Sultan
†Banaview Jonquil 2nd ..	65330	21.8.39	..	5,565	5·01	279·06	230	Jr. 2	.. ..	Banaview Design's Master
†Banaview Lilac Domino 2nd	51635	12.8.39	..	6,405	6·17	395·43	350	Mature	296, 447, 390, 496	Banyarra Nova
Banaview Lilac Domino 4th	56240	21.7.39	..	7,605	5·72	435·14	330	Sr. 4	298, 427, 394	Banaview Silvermine's Sultan
†Banaview Lilac Domino 5th	65331	8.8.39	..	8,205	5·31	435·74	310	Jr. 4	360, 467 ..	Banaview Silvermine's Sultan
Banaview Lilac Domino 7th	60478	14.7.39	..	10,259	5·02	515·40	290	Sr. 3	285, 396 ..	Banaview Silvermine's Sultan
†Banaview Lilac Domino 8th	65332	12.8.39	..	5,160	5·36	276·63	230	Jr. 2	.. ..	Banaview Silvermine's Sultan
*Banaview Lilac Domino 9th	Vol. 27	12.9.39	..	4,425	5·31	234·92	230	Jr. 2	.. ..	Banaview Design's Master
†Banaview Lilac Domino 10th	65333	15.8.39	..	7,155	4·50	321·92	230	Jr. 2	.. ..	Banaview Design's Master
†Banaview Silvermine 2nd	60479	10.8.39	..	6,675	5·74	383·14	310	Jr. 4	305, 335 ..	Banaview Silvermine's Sultan
Banaview Silvermine 3rd ..	65334	11.7.39	9½	6,734	5·53	372·69	290	Sr. 3	293, 373 ..	Banyarra Nova
Banaview Silvermine 4th ..	65335	21.7.39	..	5,994	5·33	319·54	270	Jr. 3	271 ..	Banaview Design's Master
†Banaview Silvermine 5th	65336	16.8.39	..	6,420	5·49	352·45	230	Jr. 2	.. ..	Banaview Design's Master
Banaview Springflower ..	47106	8 7.39	10½	7,892	4·12	325·40	350	Mature	335, 327, 379, 355	Kantara Starbright's Sultan
†Banaview Sunflower 2nd	65337	22.8.39	..	9,015	4·80	433·06	270	Jr. 3	384 ..	Banaview Design's Master
Selsey Design	50567	23.7.39	..	10,112	4·52	457·02	350	Mature	390, 475, 485, 448	Design's Ruler (Imp.)

* 210 days in test (herd withdrawn). † 240 days in test (herd withdrawn).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
O'Neill, J., Echuca Village, Jersey (5).										
Ullina Elaine	Vol. 27	12.8.39	13	5,700	5.90	336.03	230	Jr. 2	.. ..	Melrose Outlook
Ullina Fancy Queen ..	69476	16.9.39	10	5,953	6·60	393·32	250	Sr. 2	307 ..	Ballara Fancy King
Ullina Heather Belle 2nd ..	59330	16.7.39	17	7,314	6·16	450·25	330	Sr. 4	332, 342, 366	Kyora Dream's Gadget 2nd
Ullina Jessie 2nd ..	Vol. 27	16.7.39	15	5,346	5·68	303·86	230	Jr. 2	.. ..	Melrose Outlook
Ullina Yvonne	Vol. 27	30.7.39	13	5,973	5·57	332·42	250	Sr. 2	.. ..	Ballara Fancy King
Parks, L. A. and Sons, Romsey, Guernsey (1).										
Melbourne Golden Diana ..	4487	4.7.39	15½	7,578	5·11	387·24	350	Mature	.. ..	Woodland Fleur-de-Lys (Imp.)
Parkes-Fraser, E., Merton, Jersey (5).										
*Irona Camelia's Anthem ..	C.R.	10.9.39	..	4,125	4·79	197·46	230	Jr. 2	.. ..	Kyora Anthem's Count
Irona Dreaming Benedictive	Vol. 27	10.9.39	7½	5,393	5·80	312·55	230	Jr. 2	.. ..	Hamptonne Dreamer's Star
Irona Dreaming Cobra ..	67117	18.9.39	5	5,790	6·19	358·22	250	Sr. 2	273 ..	Hamptonne Dreamer's Star
Navua Benedictine's Lass..	54407	18.9.39	6½	4,985	6·06	301·86	310	Jr. 4	.. ..	Bravo Lad (Imp.)
*Navua Cowslip's Queen ..	54401	10.9.39	4	5,130	4·58	235·09	310	Jr. 4	212 ..	Bravo Lad (Imp.)
Payne, A. E. T., Lilydale, Guernsey (9).										
Yarraview Benefactoress ..	8196	20.8.39	27	8,985	5·80	521·13	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Delight ..	5167	24.8.39	25½	9,225	5·26	485·63	350	Mature	400, 452, 455	Camilla's Majestic of Maple Lodge (Imp.)
Yarraview De Luxe ..	8203	29.8.39	27½	8,215	5·15	423·24	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Elba	8205	12.9.39	21	8,334	5·24	436·75	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Fancy ..	6634	10.8.39	20	8,460	5·21	440·54	290	Sr. 3	385 ..	Hope's Champion of The Roubets
Yarraview Iris	8210	4.9.39	24	10,007	5·07	507·22	270	Jr. 3	444 ..	Honoria's Benefactor (Imp.)
†Yarraview Rouge ..	8217	2.9.39	..	9,930	1·61	457·76	270	Jr. 3	445 ..	Honoria's Benefactor (Imp.)
Yarraview Ruth	8218	19.9.39	21	7,091	5·27	373·36	230	Jr. 2	.. ..	Honoria's Benefactor (Imp.)
Yarraview Teeney ..	6648	25.7.39	23½	9,561	5·35	511·22	290	Sr. 3	461 ..	Camilla's Majestic of Maple Lodge (Imp.)
Phillips, J. H., Specwa, Jersey (6).										
Kantara Jessamine 2nd ..	40487	22.9.39	7	8,555	4·77	407·92	350	Mature	331, 363, 404, 422, 413, 451, 439	Glen Iris Valiant Count
Ryeland's Dainty Maid ..	64159	7.8.39	27	8,471	4·95	419·42	290	Sr. 3	267, 369 ..	Ryeland's Black Prince
Ryeland's Dainty Mistress	69035	25.9.39	20	6,951	4·92	341·83	230	Jr. 2	.. ..	Banaview Master
Ryeland's Nanette ..	64160	22.7.39	10½	6,050	5·79	350·06	290	Sr. 3	236, 322 ..	Orphanage Zaffarine Prince
Ryeland's Vanilla Slice ..	64161	7.8.39	20½	7,385	6·04	445·81	310	Jr. 4	263, 350 ..	Orphanage Zaffarine Prince
Ryeland's Wallflower ..	Vol. 27	21.9.39	14	5,579	5·47	305·34	230	Jr. 2	.. ..	Banaview Master
Powell, Mrs. K. E., Bacchus Marsh, Jersey (7).										
Mount Violet Beautiful Countess	58591	5.8.39	11	6,708	4·77	319·83	330	Sr. 4	.. ..	Woodside Silver Count
Mount Violet Beauty Bawn	41156	25.9.39	5	6,097	4·86	296·27	350	Mature	202 ..	Carson of Banyule
Mount Violet Joyful Kyeema	63239	30.7.39	10½	5,187	6·08	315·53	270	Jr. 3	.. ..	Woodside Silver Count
Mount Violet Lotus ..	Vol. 27	28.7.39	14½	7,277	5·19	377·39	230	Jr. 2	.. ..	Mount Violet Kyeema's You'll Do
Mount Violet Queen Bess	C.R.	1.7.39	11½	5,487	6·02	330·30	230	Jr. 2	.. ..	Woodside Silver Count
Mount Violet Rosalie Bawn	54281	10.9.39	12	6,009	5·16	309·81	350	Mature	.. ..	Carson of Banyule
Mount Violet Rosebud ..	Vol. 27	1.7.39	12½	6,015	5·39	324·43	230	Jr. 2	.. ..	Mount Violet Kyeema's You'll Do
Powell, T. S., Mansfield, Jersey (11).										
Carellen Fancy Clementine	65374	18.9.39	14	7,370	5·44	401·20	270	Jr. 3	336 ..	Wompini Vagabond King
Carellen Lady Margaret ..	65876	27.8.39	13	7,336	6·00	440·47	230	Jr. 2	.. ..	Lord Starbright of Darnum Park
Carellen Lady Starbright ..	65877	27.8.39	18½	6,851	6·11	418·56	230	Jr. 2	.. ..	Lord Starbright of Darnum Park
Carellen Mermaid 2nd ..	65878	8.9.39	22	9,909	5·54	548·66	270	Jr. 3	459 ..	Lord Starbright of Darnum Park
Carellen Princess Stella ..	65879	5.9.39	14½	6,059	6·44	389·91	230	Jr. 2	.. ..	Lord Starbright of Darnum Park
Mornmoot Starbright 2nd	54254	5.9.39	22	8,615	5·39	464·01	310	Jr. 4	319, 314 ..	Werribee Prince Madeira
Mornmoot Stellar Princess	45272	14.9.39	21	7,760	5·38	417·51	350	Mature	349, 428, 391, 392	Werribee Prince Madeira
Monterey Maid	49602	10.8.39	20½	9,968	5·04	502·36	350	Mature	423, 460, 520	Mornmoot Starbright King
Monterey Maid's Mermaid	58528	14.7.39	33½	11,426	5·32	607·73	350	Mature	442, 439, 376	Rosecliff Mariposa's Master
Monterey Melody's Mascot	58530	5.8.39	23	11,513	5·07	583·33	350	Mature	420, 398, 547	Rosecliff Mariposa's Master
*Wompini Starbright ..	60091	20.9.39	4	6,307	6·34	399·61	350	Mature	371, 395, 428	Werribee Butter King
Prout, A. P., Leongatha, Jersey (5).										
Five Gums Goldie 10th ..	51283	31.8.39	14	6,272	5·52	346·49	330	Sr. 4	.. ..	Werribee Alanda
Five Gums Primula 15th ..	66467	3.8.39	13½	5,501	5·95	327·15	250	Sr. 2	.. ..	Five Gums Fair Lark
Pineleigh Butter Gem 3rd	68656	22.8.39	10½	6,266	5·99	375·20	250	Sr. 2	.. ..	Glenhope Noble Butterwinks
Pineleigh Marchflower 3rd	Vol. 27	4.9.39	7	5,906	5·79	341·69	290	Sr. 3	.. ..	Glenhope Noble Butterwinks
Pineleigh Primula ..	Vol. 27	22.8.39	10½	5,003	5·97	298·60	230	Jr. 2	.. ..	Five Gums Fair Lark
Raggatt, F., Tongala, Jersey (6).										
Strathbow Goldie 9th ..	37637	13.8.39	17	7,274	5·21	379·13	350	Mature	290, 353, 414, 433	Banyule Mollerne
Strathbow Goldie 10th ..	38090	17.7.39	20	7,599	5·63	427·84	350	Mature	312, 425, 419, 351, 428	Banyule Mollerne
Strathbow Goldie 11th ..	46226	24.7.39	16½	9,089	5·29	480·56	350	Mature	321, 416, 433	Duke of The Lake (Imp.)
Strathbow Goldie 16th ..	59521	27.7.39	18½	6,827	5·80	395·95	290	Sr. 3	290, 382 ..	Grangelea Dapper
Strathbow Goldie 19th ..	64327	28.8.39	16½	6,282	5·89	369·75	270	Jr. 3	363 ..	Grangelea Dapper
Strathbow Goldie 20th ..	69156	31.8.39	11	5,825	5·36	312·14	230	Jr. 2	.. ..	Tooravale Arbitrator

* 240 days in test. ‡ 210 days in test (died).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Read, Estate of Late J. D., Springhurst, Jersey (12).										
Springhurst Aniline Lily ..	59480	8.8.39	4	5,555	5·87	325·97	250	Sr. 2	360 ..	Springhurst Design's Analyst
Springhurst Aniline Narcissus	55270	11.9.39	16	7,623	5·18	395·17	310	Jr. 4	344, 435 ..	Springhurst Design's Analyst
Springhurst Blonde Alsyke	50623	29.7.39	17	7,611	5·05	384·34	350	Mature	269, 432, 384	Bellefaire Seaborn Successor
Springhurst Blonde Narcissus	59484	8.8.39	16	7,415	5·04	373·68	270	Jr. 3	301 ..	Springhurst Sybil Successor
Springhurst Gamboge Tomato	55277	25.8.39	23½	8,254	5·04	415·66	310	Jr. 4	403, 500 ..	Bellefaire Seaborn Successor
Springhurst Hussy Alsyke	50630	25·7·39	16½	7,536	5·04	447·87	350	Mature	281, 403, 391	Bellefaire Seaborn Successor
Springhurst Superlative Nardoo	69131	13.9.39	11½	4,085	6·27	312·60	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Sybil Lily ..	41998	15.7.39	5½	6,632	4·99	331·23	350	Mature	432, 551, 509, 542, 509, 423	Bellefaire Seaborn Successor
Springhurst Sybil Medick	41999	25.7.39	11½	6,426	5·82	373·73	350	Mature	356, 376, 524, 577, 557, 401	Bellefaire Seaborn Successor
Springhurst Sybil Soya ..	50634	8.7.39	11½	8,764	4·73	414·93	350	Mature	392, 442, 601	Bellefaire Seaborn Successor
Springhurst Sybil Tulip ..	55281	30.6.39	20	9,309	5·51	513·30	330	Sr. 4	329, 425, 492	Springhurst Golden Gamboge
Springhurst Tomato 3rd ..	38110	16.9.39	23½	8,096	5·61	454·17	350	Mature	450, 537, 565, 540, 542, 375	Starbright's Prince of Glen Iris
Richardson, W. S., Bacchus Marsh, Jersey (5).										
Clarendon Eyre Waltz Dream	33953	31.7.39	18	8,093	4·92	398·17	350	Mature	368, 452, 447, 494, 448, 384, 249	Eminent's Achievement of Clarendon Eyre
Crystal Brook Glow ..	47810	2.7.39	19	6,998	5·44	380·55	350	Mature	292, 475, 296	Crystal Brook Noble
Sutton Lea Airflier ..	38134	18.7.39	21	7,910	6·25	494·42	350	Mature	342, 453, 410, 414, 360, 358	Banyule Petalon 2nd
Sutton Lea Bluebell ..	Vol. 27	28.7.39	11	4,451	4·84	215·54	230	Jr. 2	.. ..	Uphaven Silverstrain
Sutton Lea Molly ..	64397	25.7.39	20	7,680	5·46	419·12	290	Sr. 3	224 ..	Staghorn Prince Aldan
Ronalds, O., Tarago, Jersey (3).										
Jindivick Heroine 8th ..	57868	4.8.39	18	9,452	4·38	414·11	330	Sr. 4	440, 450 ..	Somerville Master Babs
Jindivick Valda's Lass ..	62334	4.8.39	12	8,286	5·34	442·06	330	Sr. 4	396, 384 ..	Somerville Master Babs
Somerville Northern Princess 3rd	46156	12.9.39	16	7,387	4·88	360·31	350	Mature	258, 392 ..	Somerville Reputation
St. Joseph's Home, Sebastopol, Jersey (5).										
Belgonia Duke's Lady 2nd	56319	30.8.39	13½	7,229	4·95	357·96	330	Sr. 4	.. ..	Duke of The Lake (Imp.)
Belgonia Lady Capture ..	Vol. 27	8.9.39	14	5,712	4·77	272·37	230	Jr. 2	.. ..	Design's Ruler (Imp.)
Lipook Annette	67657	18.9.39	15½	6,570	4·88	320·37	250	Sr. 2	.. ..	Lipook Golden Noble
Lipook Queen of Hearts ..	C.R.	15.8.39	6½	4,280	5·64	241·33	230	Jr. 2	.. ..	Marfield Joker
Lipook Silvette	62818	29.8.39	5	4,755	4·99	237·40	350	Mature	.. ..	Lipook Narkunda Xenia
Salesian College, Sunbury, Friesian (5).										
Enterprize Longbeach Sylvia 2nd	C.R.	15.9.39	19½	11,989	3·64	435·94	350	Mature	.. ..	Graindale Longbeach Hero
Rupertswood Inka Josie ..	4924	14.9.39	19	13,901	3·64	506·56	350	Mature	270, 388, 525	Cordyline Cremona
Rupertswood Josie Griselda	Vol. 14	5.7.39	23½	11,417	3·95	451·40	250	Sr. 2	.. ..	Rupertswood Inka Jo
Rupertswood Princess Domino	Vol. 14	22.9.39	20½	8,365	3·36	281·48	250	Sr. 2	.. ..	Turepo Prince Domino (Imp.)
Rupertswood Woodcrest Milkmaid	C.R.	26.8.39	25	8,055	4·14	333·77	270	Jr. 3	.. ..	Bolokeb Thorold
Sambell, A. K. T., Phillip Island, Dairy Shorthorn (1).										
*River Glen Clarabelle ..	Vol. 2	5.9.39	4	8,181	3·70	302·68	350	Mature	.. ..	Dorrie's Royal of Wangara
Shearman, A. and W., Darnum, Jersey (15).										
Darnum Park Eminent's Haha	61261	6.7.39	15	7,252	5·92	429·03	350	Mature	361, 414, 362	Darnum Park Starbright's Masterpiece
Darnum Park Milkmaid ..	C.R.	4.9.39	11	5,913	6·17	364·69	270	Jr. 3	.. ..	Darnum Park Starbright's Masterpiece
Darnum Park Milkmaid 2nd	C.R.	10.9 39	10½	5,337	6·42	345·63	230	Jr. 2	.. ..	Darnum Park Starbright's Masterpiece
Darnum Park Minnie Haha 2nd	C.R.	3.7.39	20	8,565	5·31	455·22	270	Jr. 3	213 ..	Darnum Park Starbright's Masterpiece
Darnum Park Molly Haha	61263	3.7.39	24	10,610	4·43	470·53	350	Mature	346, 331, 329	Master Clement of Glen Iris
Darnum Park Perfection ..	61265	15.9.39	6½	6,582	5·89	387·87	350	Mature	289, 382, 376	Oak Park Goldfinder
†Darnum Park Perfection 2nd	C.R.	7.9.39	4	1,140	6·66	75·94	270	Jr. 3	.. ..	Darnum Park Leonie's Attraction
Darnum Park Princess ..	61266	27.7.39	15½	6,617	5·86	387·75	330	Sr. 4	312, 343, 378	Darnum Park Starbright's Masterpiece
Darnum Park Royal Duchess	61268	8.9.39	6½	5,720	6·09	348·38	330	Sr. 4	264, 232, 273	Darnum Park Starbright's Masterpiece
Darnum Park Starbright ..	61269	18.7.39	17½	7,785	6·29	490·00	310	Jr. 4	441, 392 ..	Darnum Park Starbright's Masterpiece
Darnum Park Starbright 2nd	C.R.	10.9.39	10½	4,675	5·71	266·86	230	Jr. 2	.. ..	Darnum Park Minnie Boy
Darnum Park Sweet Lady	C.R.	20.9.39	9	4,602	5·97	274·70	230	Jr. 2	.. ..	Darnum Park Starbright's Masterpiece

* 246 days in test. † 60 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Shearman, A. and W., Carnum, Jersey, (15)—*continued.*										
Oak Park Royal Duchess	45496	24.7.39	6½	5,931	5·65	334·82	350	Mature	368, 469, 430, 413, 340	Brucevale Lord Fancy Attraction
Sleepy Valley Milkmaid ..	59447	27.7.39	12½	6,255	6·28	392·96	350	Mature	315, 470, 463, 389, 381, 347	Holly Dell Twylish
Wompini Leonie 12th ..	69760	29.7.39	8½	4,841	5·97	289·25	290	Sr. 3	234, 222 ..	Wompini Erl King
Shearn, J., Jindivick, Jersey (4).										
Jindivick Dainty Girl ..	67224	28.8.39	5	4,667	5·42	252·88	230	Jr. 2	.. ..	Somerville Master Babs
Jindivick Heroine 13th ..	67226	5.9.39	4½	4,985	6·14	306·13	250	Sr. 2	229 ..	Jindivick Airman
Jindivick Princess ..	67228	27.8.39	4½	6,271	5·02	314·76	270	Jr. 3	285 ..	Jindivick Airman
Jindivick Valda's Queen ..	67230	28.7.39	9	7,350	4·93	362·05	290	Sr. 3	325 ..	Somerville Master Babs
Smith Bros., Mirboo North, Jersey (32).										
Sylvan Hill Beauty ..	38277	26.9.39	4	5,374	6·25	335·89	350	Mature	435, 375, 405, 359, 421, 323, 359	Somerville Heir Apparent
Sylvan Hill Belle ..	69183	30.7.39	11½	4,670	6·57	307·03	250	Sr. 2	235 ..	Glen Iris Bow Bells
Sylvan Hill Bluebell ..	50735	4.8.39	13½	6,314	5·50	347·44	350	Mature	345, 321, 405, 396	Somerville Heir Apparent
Sylvan Hill Bonnie Mary	55377	4.8.39	16½	7,498	5·92	443·89	350	Mature	301, 409, 421, 388	Jerseyholm Handsome Boy 3rd
Sylvan Hill Bouquet ..	59600	1.8.39	13½	5,051	7·24	365·83	330	Sr. 4	264, 317, 271	Jerseyholm Handsome Boy 3rd
Sylvan Hill Brunette ..	59601	28.7.39	11½	3,995	5·45	217·58	330	Sr. 4	223, 254, 286	Sylvan Hill Starlight's Pride
Sylvan Hill Buttercup ..	46299	28.8.39	14	7,032	5·94	417·96	350	Mature	256, 373, 423, 382, 387	Somerville Heir Apparent
Sylvan Hill Charm ..	46300	31.7.39	17	8,436	4·99	420·86	350	Mature	286, 426, 347, 432, 368, 339	Somerville Heir Apparent
Sylvan Hill Charm 2nd ..	Vol. 27	28.8.39	11	5,406	5·48	296·07	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Charmaine ..	55378	9.8.39	14	6,662	6·14	408·73	350	Mature	232, 344, 365, 295	Jerseyholm Handsome Boy 3rd
Sylvan Hill Countess ..	38278	28.7.39	19½	7,124	5·18	369·05	350	Mature	443, 379, 384, 367, 374, 379	Somerville Heir Apparent
Sylvan Hill Duchess ..	50736	24.7.39	20	8,640	5·66	489·12	350	Mature	409, 350, 427, 511, 413	Somerville Heir Apparent
Sylvan Hill Elaine ..	Vol. 27	6.9.39	9	4,942	5·62	277·54	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Empire Queen	50737	6.8.39	14½	7,380	5·30	391·05	350	Mature	311, 396, 379, 393, 341	Somerville Heir Apparent
Sylvan Hill Evensong ..	Vol. 27	16.8.39	13	6,684	5·39	360·50	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Handsome Bell	64407	7.8.39	16	6,670	6·73	448·91	290	Sr. 3	295, 281 ..	Glen Iris Bow Bells
Sylvan Hill Handsome Girl	33762	22.7.39	11½	6,665	6·19	412·34	350	Mature	419, 360, 429, 381, 450, 400, 402	Jerseyholm Handsome Boy 3rd
Sylvan Hill Handsome Lassie	Vol. 27	22.8.39	8	3,849	6.34	244.10	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Joyful ..	50738	22.7.39	19	8,472	5·17	437·99	350	Mature	345, 337, 397, 471, 455	Somerville Heir Apparent
Sylvan Hill Lady Alma ..	38282	22.7.39	13½	7,331	5·31	389·25	350	Mature	363, 364, 409, 380, 500, 442, 359	Somerville Heir Apparent
Sylvan Hill Larkspur ..	69190	5.8.39	11½	4,908	6·88	337·88	250	Sr. 2	270 ..	Glen Iris Bow Bells
Sylvan Hill Lily 3rd ..	64409	9.8.39	4	1,957	6·65	130·23	310	Jr. 4	316, 393 ..	Glen Iris Bow Bells
Sylvan Hill Linda ..	64410	17.9.39	9	5,982	6·07	363·37	290	Sr. 3	327, 414 ..	Glen Iris Bow Bells
Sylvan Hill Meadow Queen	55381	7.9.39	12½	6,212	5·94	368·88	350	Mature	243, 348, 352, 292	Jerseyholm Handsome Boy 3rd
Sylvan Hill Molly's Bell ..	64412	31.7.39	10	6,428	5·39	346·66	290	Sr. 3	252, 328 ..	Glen Iris Bow Bells
Sylvan Hill Noble Bells ..	64413	19.9.39	8	5,229	6·26	327·29	290	Sr. 3	255, 306 ..	Glen Iris Bow Bells
Sylvan Hill Opal ..	59606	28.7.39	17	7,476	6·67	498·37	330	Sr. 4	331, 396, 310	Jerseyholm Handsome Boy 3rd
Sylvan Hill Princess Pat ..	64414	7.8.39	10	3,750	6·57	246·50	290	Sr. 3	244, 290 ..	Sylvan Hill Handsome Pat
Sylvan Hill Sunlight ..	55383	27.7.39	9½	5,024	5·79	290·79	350	Mature	264, 302, 245, 323	Sylvan Hill Starlight Pride
Sylvan Hill Thelma ..	46308	21.8.39	17	7,731	4·94	381·75	350	Mature	268, 371, 330, 332, 359	Somerville Heir Apparent
Sylvan Hill Trixie ..	Vol. 27	25.8.39	8	4,524	6·12	277·00	230	Jr. 2	.. ..	Sylvan Hill Magnet
Sylvan Hill Vanity ..	50740	27.7.39	13½	6,521	5·25	342·44	350	Mature	321, 309, 373, 393, 372	Somerville Heir Apparent
Smith, R. W., Murraydale, Friesian (12).										
Wattle Bank Cremona 4th	Vol. 14	4.9.39	21	8,520	3·38	288·10	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Fairy 2nd ..	Vol. 14	8.8.39	31	12,530	3·21	401·74	290	Sr. 3	.. ..	Hengest Lizzie Segis
Wattle Bank Fairy 3rd ..	Vol. 14	5.9.39	37	10,736	3·08	330·77	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Fairy 4th ..	Vol. 14	1.9.39	21	10,800	3·50	377·64	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Juliet ..	Vol. 14	4.9.39	20	11,618	3·52	403·68	330	Sr. 4	.. ..	Hengest Lizzie Segis
*Wattle Bank Primrose 2nd	Vol. 14	10.9.39	4	7,170	3·65	261·69	250	Sr. 2	.. ..	Hengest Lizzie Segis
Wattle Bank Princess 3rd	Vol. 14	6.8.39	23	13,539	3·43	463·76	330	Sr. 4	.. ..	Hengest Lizzie Segis
Wattle Bank Princess 5th	Vol. 14	30.8.39	25	9,356	3·86	361·45	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Roads End Sandra ..	Vol. 14	28.8.39	50	16,280	4·07	662·07	350	Mature	.. ..	Winlaton Pioneer
Wattle Bank Sandra 2nd	Vol. 14	3.9.39	24	9,942	3·20	317·69	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Violet ..	Vol. 14	2.8.39	30	14,347	3·04	436·19	350	Mature	.. ..	Warwick Plebe Leonora
†Wattle Bank Violet 2nd..	Vol. 14	4.9.39	..	8,048	2·90	233·37	230	Jr. 2	.. ..	Wattle Bank Segis De Kol

* 240 days in test. † 180 days in test (died).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Stirling, H. V., Meade, Jersey (6).										
Banyule Ishta	51650	14.8.39	12	6,321	5·20	328·69	290	Sr. 3	347, 374 ..	Banyule Pitman
Coimbra Ishta	Vol. 27	6.9.39	13½	5,471	4·80	262·46	230	Jr. 2	.. ..	Banyule Statoscope
Coimbra Rose	Vol. 27	22.7.39	11½	4,505	5·39	242·86	230	Jr. 2	.. ..	Coimbra Silver Beau
Coimbra Silvermine ..	56854	5.9.39	29	10,047	4·90	491·86	330	Sr. 4	338, 392, 421	Banyule Triplane
Coimbra Silver Queen ..	61131	25.9.39	11	6,411	4·90	314·33	250	Sr. 2	271 ..	Banyule Statoscope
Coimbra Silver Queen 2nd	Vol. 27	12.8.39	14	5,952	4·65	276·60	230	Jr. 2	.. ..	Banyule Statoscope
Tait, W. G., Dreeite, Jersey (3).										
Stonybank Gaiety Girl 8th	C.R.	9.8.39	15½	5,830	5·98	348·43	230	Jr. 2	.. ..	Lucerne Vale Trixie 2nd's Masterpiece
*Stonybank Gaiety Girl 9th	Vol. 27	28.8.39	4	5,235	5·62	294·90	230	Jr. 2	.. ..	Lucerne Vale Carnation's Master
Stonybank Mercedes Daisy 2nd	Vol. 27	14.8.39	14	5,274	6·25	329·84	230	Jr. 2	.. ..	Lucerne Vale Trixie 2nd's Masterpiece
Tandberg, G. and Son, Warragul, Illawarra Shorthorn (5).										
Veresdale Bushbee ..	Vol. 7	24.9.39	9½	6,599	4·00	263·73	230	Jr. 2	.. ..	Ovensdale Pearl's Renown
Veresdale Collie	Vol. 7	11.9.39	5½	5,477	4·01	219·50	250	Sr. 2	.. ..	Swanlea Glenray
Veresdale Lulu	Vol. 7	26.9.39	19	6,080	4·04	245·49	230	Jr. 2	.. ..	Veresdale Diamond
Veresdale Poppy ..	Vol. 7	12.9.39	7½	6,533	3·75	244·88	230	Jr. 2	.. ..	Veresdale Diamond
Grange Lea Birdie ..	11280	19.9.39	..	8,918	3.99	353.56	350	Mature	305, 331	Parkview Guardsman
Tomasetti, B. G., Drouin West, Ayrshire (9).										
Alvaston Aster	31921	17.8.39	18½	7,835	4·96	388·70	270	Jr. 3	247 ..	Cathcart Masterpiece
Alvaston Margot ..	31923	19.8.39	18	9,000	4·25	382·53	270	Jr. 3	235 ..	Cathcart Masterpiece
Glen Athol Graceful ..	20074	7.7.39	19	10,422	4·20	437·48	350	Mature	433, 358, 409, 355	Glen Athol Jimmie
Glencorren Hallmark ..	C.R.	21.9.39	15	8,023	4·59	368·16	350	Mature	210, 321, 259	Scotswood Michael 2nd
Glencorren Lilac	22832	19.7.39	18	8,441	4·46	376·75	350	Mature	393, 378, 488, 539, 400, 407	Scotswood Michael 2nd
Gorinn Merrymaid ..	C.R.	13.8.39	17	6,114	4·46	272·73	230	Jr. 2	.. ..	Glencorren Edison
Glencorren Valmai ..	30530	15.8.39	10	6,800	4·44	301·84	350	Mature	234, 320, 317	Scotswood Michael 2nd
Glencorren Venus ..	26202	17.7.39	19½	9,164	4·35	398·93	350	Mature	254, 350, 311, 409, 386	Scotswood Michael 2nd
Glencorren Vex	32417	16.9.39	23½	8,682	4·42	383·82	230	Jr. 2	.. ..	Glencorren Edison
Trevaskis, F. T., Tongala, Jersey (9).										
Ballara Flower 5th ..	47093	5.8.39	14	7,199	4·93	354·89	350	Mature	264, 336 ..	Ballara Neat Lad
Ballara Flower 7th ..	60445	6.8.39	12	5,879	5·26	309·18	250	Sr. 2	299 ..	Kyora Dream's Gadget 2nd
Ballara Ideal 7th ..	56227	5.9.39	7	6,033	5·15	310·84	310	Jr. 4	325, 356 ..	Kyora Dream's Gadget 2nd
Ballara Ideal 8th ..	60446	23.9.39	7	5,708	5·31	303·03	270	Jr. 3	269 ..	Kyora Dream's Gadget 2nd
Ballara Ideal 10th ..	65297	29.8.39	9	5,018	5·53	278·06	230	Jr. 2	.. ..	Kyora Dream's Gadget 2nd
Ballara Model 15th ..	60450	6.8.39	11½	5,421	5·94	321·87	250	Sr. 2	.. ..	Kyora Dream's Gadget 2nd
Ballara Moira 7th ..	60451	7.9.39	6½	4,074	5·98	279·59	250	Sr. 2	267 ..	Kyora Dream's Gadget 2nd
Carinya Black Rose ..	52138	20.7.39	6½	5,289	5·27	278·97	330	Sr. 4	310, 421 ..	Werribee Twylish Master
The Valley Frisky Stumpy	59606	23.9.39	8½	8,052	5·27	424·56	350	Mature	366, 429 ..	Glen Iris Beau
Trewin, J. V., Nathalia, Jersey (5).										
Weir View Blossom's Design	51160	26.8.39	10	7,222	4·95	357·33	350	Mature	354, 356 ..	Design's Ruler (Imp.)
Weir View Golden Design	55819	9.7.39	19	8,177	5·33	436·05	290	Sr. 3	330, 418 ..	Design's Ruler (Imp.)
Weir View Golden Design 3rd	64853	15.7.39	16	4,865	5·42	263·92	230	Jr. 2	.. ..	Weir View Golden Duke
Weir View Golden Duchess	51161	30.6.39	27	9,054	4·95	477·47	350	Mature	385, 398, 440, 441	Duke of The Lake (Imp.)
Weir View Greetings ..	42459	20.7.39	18½	8,685	5·22	453·55	350	Mature	434, 372, 412	Belgonia Milk Lad
Vagg, E. J., Leongatha, Jersey (16).										
Bonnay Amanda's Doris ..	51865	3·9·39	16	7,667	4·82	369·68	350	Mature	307, 364, 402, 353	Jerseyinn Edith's Masterpiece
†Bonnay Amanda's Marina	56463	27.7.39	..	4,513	6·10	275·14	350	Mature	324, 339 ..	Bonnay Carrie's Master
Bonnay Amanda's Melba ..	Vol. 27	29.7.39	11½	5,292	4·52	239·45	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Bonnay Amanda's Patsy ..	65535	5.8.39	13	6,324	6·22	393·49	250	Sr. 2	334 ..	Jerseyinn Edith's Masterpiece
Bonnay Doris's Averil ..	Vol. 27	23.7.39	15½	5,879	5·42	318·88	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Bonnay Jessie's Ethel ..	65537	26.7.39	12½	5,034	5·76	289·74	250	Sr. 2	273 ..	Bonnay Edith's Master-strain
Bonnay Jessie's Freda ..	Vol. 27	11.8.39	12½	5,360	5·61	300·46	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Bonnay Love's Elaine ..	60727	29.7.39	10	6,585	6·81	448·57	290	Sr. 3	304, 315 ..	Bonnay Edith's Master-strain
Bonnay Love's Grace ..	65538	20.9.39	10½	4,781	5·32	254·21	250	Sr. 2	205 ..	Bonnay Edith's Master-strain
Bonnay Marina's Vanity ..	65539	22.7.39	10	4,410	6·08	267·91	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Bonnay Mystery's Dawn ..	Vol. 27	16.7.39	11½	5,486	5·48	300·51	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Bonnay Mystery's Lilac ..	26465	11.9.39	11½	6,005	6·20	372·28	350	Mature	209, 316, 350, 307	Bonnay Love's Masterman
Bonnay Mystery's Roma ..	Vol. 27	11.8.39	15	6,260	5·54	347·06	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Bonnay Phyllis Laura ..	65540	6.8.39	13	4,989	5·83	290·84	250	Sr. 2	233 ..	Jerseyinn Edith's Masterpiece
Bonnay Winnie's Midget ..	Vol. 27	29.7.39	14	6,522	5·15	335·64	230	Jr. 2	.. ..	Bonnay Edith's Master-strain
Rydon May Queen 2nd ..	55151	21.9.39	24	9,921	5·30	525·50	350	Mature	379, 452, 648, 531	Melrose Migrant

* 240 days in test. † 247 days in test (sold).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Vaughan Bros., Girgarre, Jersey (7).										
Lynroy Dainty's Gladys ..	C.R.	8.9.39	26½	9,722	5·62	546·85	350	Mature	336, 384, 510	Werribee Laverock
Lynroy Fancy 4th ..	62864	6.8.39	16½	7,928	5·87	465·05	330	Sr. 4	382, 268, 374	Werribee Laverock
Lynroy Gladys 6th ..	Vol. 27	9.9.39	13	6,294	5·57	350·87	230	Jr. 2	.. ..	Werribee Laverock
Lynroy Jean 6th ..	C.R.	7.7.39	9½	4,518	5·98	270·16	230	Jr. 2	.. ..	Werribee Laverock
Lynroy Natty 3rd ..	Vol. 27	10.9.39	15½	6,090	5·66	344·75	230	Jr. 2	.. ..	Selsey Grandmaster
Lynroy Pixie 3rd ..	Vol. 27	6.9.39	16	5,714	5·97	341·10	230	Jr. 2	.. ..	Werribee Laverock
Lynroy Sprite 2nd ..	62872	10.8.39	13½	5,967	5·93	353·64	250	Sr. 2	.. ..	Lynroy Gladiator
Wade, W. J., Stratford, Jersey (6).										
Glen Iris Golden Belle ..	52814	11.9.39	15	7,177	5·27	378·41	310	Jr. 4	294, 229 ..	Design's Golden Oxford (Imp.)
Glen Iris Golden Viola ..	52818	15.9.39	11	6,093	5·57	339·65	310	Jr. 4	303, 124 ..	Design's Golden Oxford (Imp.)
Inverbroom Molly's Bunty	57762	29·8·39	13	7,284	5·33	387·92	310	Jr. 4	289, 335 ..	Grangelea Butter Boy 3rd
Inverbroom Ruby's Bunty	57763	18·7·39	12½	7,145	4·91	350·66	310	Jr. 4	228, 233 ..	Grangelea Butter Boy 3rd
Inverbroom Ruby's Marie	67091	15.9.39	15½	8,822	5·76	508·13	230	Jr. 2	.. ..	Inverbroom Marie's Majesty
Troed-yr-Rhiw Fydd 9th ..	64655	3.9.39	14	6,747	5·09	343·55	270	Jr. 3	184 ..	Clarendon Eyre Eminent's Boomerang 4th
Walker, C. S., Swan Hill, Jersey (10).										
Clarendon Eyre Love Lies 9th	65950	22.9.39	16½	6,546	5·17	338·17	250	Sr. 2	226 ..	Clarendon Eyre Golden Oxford
Glen Iris Golden Design ..	52816	23.9.39	14	7,407	5·33	394·54	310	Jr. 4	279, 337 ..	Design's Golden Oxford (Imp.)
Grangelea Rose Marie ..	57547	19.9.39	19½	6,158	4·90	301·69	310	Jr. 4	286, 283 ..	Grangelea Roderick
Warwick Augustus Marie 3rd	69624	28.8.39	18	6,536	5·25	343·45	350	Mature	271 ..	Glen Iris Golden Lord
Warwick Cream Stockings 5th	C.R.	17.9.39	22	6,512	4·74	308·94	230	Jr. 2	.. ..	Warwick Golden Lord
Warwick Polly	38488	13.7.39	20	7,953	5·19	413·09	350	Mature	142, 355, 308, 352, 292, 352	Chevrolet of Banyule
Warwick Polly 4th ..	59945	8.7.39	8	5,723	5·90	337·75	350	Mature	265, 329, 372	Glen Iris Golden Lord
Warwick Princess Iris ..	64827	25.7.39	33	9,939	4·53	450·11	350	Mature	273, 280, 319, 366	Preston Star King
Weir View Golden Design 2nd	59968	30.8.39	26	8,504	5·56	472·72	290	Sr. 3	323, 477 ..	Weir View Golden Duke
Weir View Golden Duchess 2nd	51162	14.8.39	18½	7,749	5·42	419·79	330	Sr. 4	347, 361, 486	Weir View Laddie 2nd
Wallace, A., Dingee, Jersey (2).										
Grovelea Snow Girl ..	62018	25.9.39	7½	4,133	5·00	206·74	350	Mature	.. ..	Myall Ben
Myall Lady May ..	34026	25.9.39	5½	5,807	4·00	232·12	350	Mature	.. ..	Myall Dainty Lad
Warragul High School, Warragul, Red Poll (4).										
Gipps Fiona	2388B	30.6.39	4½	7,079	3·71	262·49	350	Mature	287, 344, 264, 375, 345, 252, 258	Woodburn Laureate
Gipps Marie	2878A	7.9.39	20½	7,142	4·37	311·89	350	Mature	241, 209, 412, 306, 242, 326, 326	Woodburn Laureate
Gipps Olga	5815A	20.8.39	11½	6,309	4·29	270·88	230	Jr. 2	.. ..	Blackwood Butler
Gipps Ultima	3662A	15.7.39	8	7,181	4·14	297·05	350	Mature	248, 201, 220, 247	Gipps Byron
Waterhouse, J. H. and Son, Pakenham, Jersey (2).										
Navuloa Grand Magnet ..	63357	8.8.39	23	8,274	5·50	454·69	250	Sr. 2	.. ..	Werribee Grandmaster
Navuloa Master's Lass 4th	58685	23.9.39	16½	8,300	5·70	472·80	290	Sr. 3	.. ..	Werribee Grandmaster
Watson, K. E., Pakenham Upper, Jersey (2).										
Goronga Farm First Flight	Vol. 27	18.8.39	15	6,120	5·50	336·35	270	Jr. 3	213 ..	Werribee Alanda
*Goronga Farm Madeira's Modesty	57522	25.7.39	4	5,490	5·77	265·03	330	Sr. 4	265, 292, 274	Werribee Prince Madeira
Williams, F. A., Bamawm Extension, Jersey (5).										
Bamawm Daisy Grey ..	65321	14.9.39	20	7,155	5·25	375·57	250	Sr. 2	248 ..	Bamawm Leon
Bamawm Fancy Garenne ..	60471	24.9.39	23	6,872	5·79	397·64	250	Sr. 2	.. ..	Bamawm Bonnie Boy
Bamawm Pretty Lady ..	56239	16.9.39	29	10,572	6·00	634·41	330	Sr. 4	366, 329, 313	Bamawm Master Gaypiece
Bamawm Princess Noella	65323	31.8.39	25½	8,252	5·72	471·89	290	Sr. 3	328 ..	Bamawm Master Gaypiece
Bamawm Princess Pamela	47103	24.9.39	20	9,863	5·44	536·64	350	Mature	386, 404, 415, 403, 250	Bamawm Leon
Wilson, A., Port Fairy North, Ayrshire (10).										
Carracoorte Brownie 22nd	24681	10.9.39	8½	6,895	4·28	294·86	350	Mature	202, 241, 312, 283, 277	Carracoorte Gerty's Producer
Green Vale Beauty 5th ..	28554	3.9.39	10	7,605	3·90	296·94	350	Mature	352, 394 ..	Carracoorte Squire
Jennewar Betty	31549	2.9.39	5	5,820	4·21	245·05	270	Jr. 3	164 ..	Denbigh Ace
Jennewar Lorretta ..	32627	8.7.39	9½	4,214	4·11	174·35	230	Jr. 2	.. ..	Denbigh Ace
Jennewar Pearline ..	32628	20.7.39	12	6,051	3·76	227·74	230	Jr. 2	.. ..	Denbigh Ace
Kyle Honor	C.R.	13.8.39	9	5,247	3·63	190·69	230	Jr. 2	.. ..	Kyle All Style
Lough View Music ..	32779	27.8.39	8½	5,636	4·40	248·23	230	Jr. 2	.. ..	Carracoorte Bobby
Lough View Petunia ..	31623	23.9.39	7	5,916	3·86	228·53	250	Sr. 2	237 ..	Carracoorte St. Bernard
Lough View Viola ..	32780	24.8.39	11	4,893	4·18	204·73	230	Jr. 2	.. ..	Carracoorte Bobby
Stoneleigh Addie ..	Vol. 33	21.7.39	10½	5,447	3·87	210·84	230	Jr. 2	.. ..	Kerlie Park Maudette's Pride

* 240 days in test.

T. Rider, Government Printer, Melbourne.

Standard Herd Records

For Quarter ended 30th September, 1940

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 541, of which 367 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs the standard being as follows:—

Junior 2-year-old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year-old (between 2½ and 3 years at time of calving)	250 lb. butter-fat.
Junior 3-year-old (between 3 and 3½ years at time of calving)	270 lb. butter-fat.
Senior 3-year-old (between 3½ and 4 years at time of calving)	290 lb. butter-fat.
Junior 4-year-old (between 4 and 4½ years at time of calving	310 lb. butter-fat.
Senior 4-year-old (between 4½ and 5 years at time of calving)	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

(Except where otherwise stated, the period of test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire
Alston, Mrs. N. B. and Sons, Romsey, Jersey (9).										
Castle Coral	Vol. 27	20.10.39	9½	4,530	5·42	245·63	250	Sr. 2	.. ..	Staghorn Madeira's Twylish
Rosyth Gay Brownie ..	59332	21.12.39	15	4,665	5·95	277·58	330	Sr. 4	192, 295, 314	Werribee Gaypiece
Rosyth Gay Grevillea ..	55120	2.11.39	20	8,630	5·67	489·41	350	Mature	290, 321, 356, 404	Werribee Gaypiece
*Rosyth Meadow Queen ..	Vol. 27	19.10.39	..	3,735	5·30	197·92	230	Jr. 2	.. ..	Rosyth Jessie's Chief 5th
Rosyth Princess Rosalie ..	50505	4.10.39	15½	9,153	4·66	426·75	350	Mature	256, 337, 348, 346, 339	Aveley Antony
Rosyth Rosebud	46073	12.11.39	15	6,540	5·36	350·64	350	Mature	246, 290, 399, 319, 344, 315	Aveley Antony
*Rosyth Rose Petal ..	Vol. 27	19.10.39	..	3,698	5·48	202·80	230	Jr. 2	.. ..	Rosyth Jessie's Gaypiece 2nd
Rosyth Starbright ..	69017	17.10.39	8	6,986	5·55	388·00	250	Sr. 2	297 ..	Rosyth Antony 3rd
Rosyth Grevillea ..	46068	4.11.39	13	6,746	5·22	351·93	350	Mature	250, 300, 302, 315, 303, 342	Aveley Antony
Anderson, I., Warburton, Jersey (1).										
Banyarra Attraction 6th ..	Vol. 27	29.10.39	11	5,238	6·26	327·96	270	Jr. 3	253 ..	Banyule Worcester
Andrew, W., Whittlesea, Ayrshire (1).										
†Kelvin Grove Babe ..	24057	1.11.39	..	5,003	4·39	219·63	350	Mature	.. ..	Ladybank Luminous
Atkinson, W. K., Swan Hill, Dairy Shorthorn (16).										
Steventon Dog Rose (Imp.)	242A	28.9.39	4	8,640	3·31	286·07	350	Mature	382, 392 ..	Stokelycross Admiral
Willow Park Camelia 12th	1222E	11.10.39	21	8,602	3·68	316·26	350	Mature	331, 338 ..	Willow Park Silvermine 4th
Willow Park Camelia 22nd	Vol. 2D	18.10.39	15	9,986	3·26	325·87	270	Jr. 3	341 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 26th	Vol. 2D	14.10.39	22	8,159	3·25	265·20	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Camelia 27th	Vol. 2D	17.10.39	18¼	6,924	3·95	273·40	230	Jr. 2	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 14th ..	528D	2.10.39	19½	10,499	4·03	423·11	350	Mature	290, 381, 384	Wicklesham Lord Barrington 5th (Imp.)
‡Willow Park Comet 19th	532D	18.10.39	4	2,970	3·46	102·84	270	Jr. 3	335 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Comet 20th ..	Vol. 2	2.11.39	6	6,554	3·41	223·60	270	Jr. 3	278 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Countess 14th	1249E	30.9.39	13¼	9,534	3·72	354·68	350	Mature	250, 317, 331	Willow Park Silvermine 4th
Willow Park Countess 18th	535D	14.12.39	14	7,692	3·66	281·91	350	Mature	230, 303, 339	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 28th	543D	9.10.39	15¼	9,599	4·04	387·40	350	Mature	239, 302, 396	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Duchess 30th	545D	15.10.39	26	12,387	3·98	492·88	310	Jr. 4	381, 526 ..	Wicklesham Lord Barrington 5th (Inp.)
Willow Park Melba 29th ..	Vol. 2	28.11.39	26	9,915	3·48	345·50	270	Jr. 3	294 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Moss Rose 9th	1330E	15.11.39	22	12,042	3·65	439·36	350	Mature	414, 515, 558, 539	Willow Park Reflector
Willow Park Moss Rose 15th	Vol. 2C	31.10.39	20	8,891	3·30	293·47	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Queenie 43rd	Vol. 2C	17.11.39	30	10,575	3·50	369·83	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)

* 240 days in test (sold). † 210 days in test (sold). ‡ 180 days in test.

14198/40.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Ballarat Orphanage, Ballarat, Jersey (16).										
Orphanage Attraction 8th	54571	19.11.39	31	8,291	5·29	438·25	350	Mature	333, 331, 394	Jerseylea Quality Boy
Orphanage Audrey's Molly 2nd	41398	6.10.39	15½	8,330	4·63	385·89	350	Mature	290, 262, 458, 386, 295	Wompini V.C.
Orphanage Audrey's Molly 6th	58809	1.11.39	15	8,543	5·21	445·46	330	Sr. 4	276, 311 ..	Retford King Bracken
Orphanage Garenne 6th ..	54577	27.10.39	21½	7,304	5·55	405·64	350	Mature	336, 377 ..	Jerseylea Quality Boy
Orphanage Handsome 2nd	63534	2.11.39	17	6,562	5·12	336·16	350	Mature	316, 385 ..	Orphanage Pride
Orphanage Lady 8th ..	Vol. 27	9.10.39	12	4,067	6·16	250·67	230	Jr. 2	.. ..	Banyule Silverstone
Orphanage Lotus ..	68460	27.9.39	16	5,735	4·94	283·46	230	Jr. 2	.. ..	Orphanage Mabel's Chief
Orphanage Melba 14th ..	68461	20.10.39	20	7,857	5·52	433·46	230	Jr. 2	.. ..	Banyule Terraplane
Orphanage Molly 6th ..	58823	6.12.39	21½	6,980	6·11	426·40	330	Sr. 4	253, 263 ..	Retford King Bracken
Orphanage Pearl 5th ..	41409	13.10.39	14	8,546	5·12	437·59	350	Mature	252, 419, 388, 445	Orphanage Quicksands Prince
Orphanage Princess 3rd ..	54580	7.12.39	15	4,788	7·57	362·59	350	Mature	.. ..	Jerseylea Quality Boy
Orphanage Quicksand 5th	58827	12.10.39	8	6,304	4·94	311·42	350	Mature	346, 347, 352	Banyule Silverstone
Orphanage Quicksand 13th	Vol. 27	14.10.39	21	6,936	5·85	405·60	270	Jr. 3	275 ..	Retford King Bracken
Orphanage V.C's. Molly 4th	58829	1.11.39	23	7,704	5·10	392·59	310	Jr. 4	229, 332 ..	Rowallan Celebrity
Orphanage Zaffarine 4th ..	49978	29.10.39	17	7,721	5·45	420·85	350	Mature	365, 346, 383	Jerseylea Quality Boy
Orphanage Zaffarine 11th	Vol. 27	21.10.39	18	6,601	6·09	401·68	230	Jr. 2	.. ..	Rowallan Celebrity
Barkla, R. E. and Sons, Joyce's Creek, Jersey (1).										
*Ismalia Petal 5th ..	67122	21.10.39	4	2,880	4·86	140·07	230	Jr. 2	.. ..	Orphanage Charger
Bennett, R. H., Lancefield, Jersey (10).										
Edenhope Countess ..	66300	30.9.39	10	5,475	5·95	325·60	270	Jr. 3	.. ..	Edenhope Masterpiece
Edenhope Lady Twylish ..	66302	30.10.39	9	5,885	5·67	333·72	270	Jr. 3	.. ..	Edenhope Masterpiece
Edenhope Madeira's Model	43666	9.12.39	15	6,704	5·59	374·52	350	Mature	.. ..	Bylands Royalist
Edenhope Mavis	Vol. 27	4.11.39	12	5,018	4·59	230·34	230	Jr. 2	.. ..	Lancefield Madeira's Chance
Edenhope Myrl	57122	10.10.39	13½	8,804	5·14	452·59	350	Mature	.. ..	Edenhope Canary's Count
Edenhope Molly Madeira ..	47928	9.10.39	14	7,797	5·79	451·37	350	Mature	.. ..	Bylands Royalist
Edenhope Mrya	Vol. 27	12.11.39	11	3,783	6·17	233·30	230	Jr. 2	.. ..	Lancefield Madeira's Chance
Edenhope Necklace ..	Vol. 27	30.11.39	14	4,752	4·83	229·32	230	Jr. 2	.. ..	Lancefield Madeira's Chance
Edenhope Northwood Princess	Vol. 27	26.10.39	16	6,311	5·39	340·18	230	Jr. 2	.. ..	Lancefield Madeira's Chance
Lancefield Gilder Rose ..	62681	2.10.39	10	5,760	5·42	312·18	310	Jr. 4	.. ..	Bylands Royalist
Black, Miss G. A., Noorat, Jersey (3).										
Belgonia Design's Buttercup 3rd	60533	28.9.39	15	7,010	5·52	387·24	270	Jr. 3	315 ..	Designs Ruler (Imp.)
Noorat Sunshine Susie ..	54485	14.10.39	18½	7,931	5·67	449·42	350	Mature	363, 419 ..	Banyule Lord Silvair
Noorat Sunshine Susie 2nd	Vol. 27	25.10.39	16	7,188	4·86	349·69	230	Jr. 2	.. ..	Belgonia Noella's Peer
Black, Estate of Late I. S., Noorat, Ayrshire (6).										
Killock Juniper (Imp.) ..	80966	4.10.39	16½	7,389	5·01	369·90	250	Sr. 2	.. ..	Burton Signet
Mount Noorat Alert ..	24144	9.10.39	14	9,258	4·76	440·70	350	Mature	295, 385, 356, 328, 357, 311	Scottish Major of Gowrie Park
†Mount Noorat Alert 5th	29775	10.10.39	4	7,894	4·55	359·54	310	Jr. 4	302, 304 ..	Gowrie Park Scottish Patron
Mount Noorat Alert 8th ..	31639	10.10.39	13	5,504	4·04	222·57	230	Jr. 2	.. ..	Strathkellar Banjo
Mount Noorat Georgina 5th	29777	10.11.39	19½	10,100	4·62	466·44	330	Sr. 4	379, 318 ..	Gowrie Park Scottish Patron
Mount Noorat Georgina 7th	30776	2.10.39	15	8,418	4·96	417·17	290	Sr. 3	375 ..	Mount Noorat Loudon
Broad, Mrs. A. A., Sutton Grange, Jersey (8).										
Grangelea Bell	40060	19.11.39	22½	7,734	5·55	429·24	350	Mature	302, 328, 411, 436, 438, 505	Grangelea Daffodil's Airo
Grangelea Bess	61938	1.11.39	16	6,239	6·43	401·07	310	Jr. 4	419 ..	Grangelea Cream Boy
Grangelea Pretty Primrose 2nd	61943	3.10.39	18	6,736	5·76	388·31	270	Jr. 3	441 ..	Grangelea Daffodil's Airo
Grangelea Rosebud 10th ..	66765	2.12.39	15	4,500	5·58	251·12	230	Jr. 2	.. ..	Grangelea Daffodil's Airo
Grangelea Rosette ..	57550	31.10.39	22	7,634	5·26	401·21	310	Jr. 4	295, 431 ..	Grangelea Daffodil's Airo
Grangelea Rosette 3rd ..	Vol. 27	4.10.39	17	5,560	5.84	324·90	230	Jr. 2	.. ..	Grangelea Cream Boy
Grangelea Ruby 3rd ..	66766	13.10.39	17½	6,020	5·44	327·78	230	Jr. 2	.. ..	Grangelea Cream Boy
Grangelea Viola	66769	8.10.39	18	6,536	5.23	341·74	230	Jr. 2	.. ..	Grangelea Daffodil's Airo
Butcher, F. T., Swan Hill, Red Poll (6).										
Maryville Elva	3722A	10.11.39	23	10,269	4·26	437·48	350	Mature	304, 402, 356, 400, 239	Victoria King Bird
Maryville Etta	5049B	27.9.39	5½	8,034	4·68	375·76	350	Mature	340, 363 ..	Victoria Viking
Maryville Joan	6207D	7.10.39	5	6,840	4·69	320·97	270	Jr. 3	289 ..	Temperley Prism
*Maryville Mavis ..	5899A	7.10.39	4	4,590	3·86	176·95	250	Sr. 2	179 ..	Temperley Prism
†Maryville Melba ..	7117C	10.11.39	4	4,269	4·14	176·79	230	Jr. 2	.. ..	Temperley Prism
Maryville Model	6911A	6.10.39	11	5,753	4·45	255·83	230	Jr. 2	.. ..	Temperley Prism
Calf, A. J., Werribee South, Jersey (2).										
‡Illillouette Twinkle	Master's	C.R.	12.10.39	..	4,680	5·95	278·62	230	Jr. 2	.. ..	Finchley Master's Boy 2nd
‡Illillouette Vanilla	Master's	C.R.	18.10.39	..	4,485	6·13	274·93	230	Jr. 2	.. ..	Finchley Master's Boy 2nd

* 240 days in test. † 247 days in test. ‡ 240 days in test (herd withdrawn).

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Chadderton, J. E., Hamilton, Jersey (1).										
Glen Leigh Daphne 3rd ..	66572	10.10.39	15	6,150	5·05	310·34	230	Jr. 2	.. ..	Selsey Jupiter
Chirnside, R. M., Whittlesea, Jersey (9).										
Mornmoot Clementine ..	41121	5.11.39	16½	8,916	5·91	526·68	350	Mature	331, 549, 563, 566, 550	Werribee Prince Madeira
Mornmoot Clementine 9th	63196	17.10.39	22½	8,210	5·17	424·81	230	Jr. 2	.. ..	Werribee Warrior
*Mornmoot Fancy Madeira 4th	54245	25.11.39	..	7,590	6·02	456·59	350	Mature	412, 489, 480	Werribee Madeira Ace
Mornmoot Fancy Madeira 8th	63198	10.10.39	13½	6,567	5·72	375·88	230	Jr. 2	.. ..	Werribee Warrior
Mornmoot Fancy Starbright 4th	63200	1.10.39	16½	5,975	6·49	388·04	230	Jr. 2	.. ..	Werribee Warrior
Mornmoot Northwood Madeira	33142	29.10.39	15½	9,572	5·36	513·41	350	Mature	381, 471, 605, 589, 643, 534, 488	Werribee Prince Madeira
Mornmoot Princess Madeira	37071	11.10.39	22½	9,306	5·53	514·42	350	Mature	424, 573, 773, 794, 794, 520, 553	Werribee Grandmaster
Mornmoot Satisfaction 2nd	49661	22.12.39	29	11,149	5·65	630·44	350	Mature	353, 467, 520	Werribee Jupiter
Mornmoot Satisfaction 6th	63207	7.10.39	15	6,822	5·25	358·02	230	Jr. 2	.. ..	Werribee Warrior
Clarke, F. W., Toora, Jersey (3).										
Mer Vue Choice 3rd ..	54081	13.11.39	19	7,769	6·08	472·33	350	Mature	348, 447, 512, 532	Woorayl Flashlight
Mer Vue Choice Contralto	63047	3.10.39	19	7,956	6·25	497·58	310	Jr. 4	414, 538 ..	Barrington Largo
Mer Vue Wee Doris ..	67915	23.10.39	16	6,918	6·22	430·28	310	Jr. 4	409 ..	Barrington Largo
Clark, P. W., Whittlesea, Jersey (3).										
Coodardy Centurion's First	Vol. 27	9.10.39	26½	7,749	4·16	322·02	230	Jr. 2	.. ..	Werribee Centurion
Coodardy Gentle Annette 3rd	61157	30.11.39	23	8,229	4·83	397·29	330	Sr. 4	336 ..	Toorongo Belle's Bonaparte
Toorongo Aldan's Wyandotte	69411	8.11.39	27	9,029	5·54	500·06	250	Sr. 2	.. ..	Staghorn Lord Aldan 3rd
Clark, W. J., Monomeith, Jersey (5).										
Avonhurst Melba ..	60378	15.12.39	8	5,041	5·80	292·56	350	Mature	.. ..	Banyule Airshaft
Glenavon Diana 9th ..	57373	10.12.39	19	6,965	5·96	415·36	350	Mature	.. ..	Glenavon Starbright's Airshaft
Glenavon Diana 15th ..	66598	20.12.39	15	5,565	5·96	331·86	270	Jr. 3	.. ..	Banyule Airshaft
Glenavon Lassie's Belle ..	Vol. 27	6.12.39	14	4,917	6·46	317·69	250	Sr. 2	.. ..	Glenavon Maystar
Glenavon Starbright 2nd ..	61739	12.12.39	16	7,700	5·63	433·69	350	Mature	.. ..	Banyule Airshaft
Colenso, L. W. R., Alvie, Jersey (1).										
Normandie Ilma 3rd ..	45472	30.9.39	23½	8,041	5·72	460·24	350	Mature	241, 376, 366, 387	Peer of Lewisham
Coulthard, J. J., Whittlesea, Jersey (4).										
Jubilee Laconia	44531	25.12.39	13½	4,661	6·09	283·86	350	Mature	334, 287, 230, 270	Jubilee Wheatenlight
Lauriston Master's Belle ..	40641	21.11.39	15½	6,165	5·22	321·74	350	Mature	353, 346, 355, 324	Rathlyn Lily's Master
Walamba Dahlia ..	69562	7.10.39	12½	4,328	5·69	246·11	330	Sr. 4	233, 271, 310	Clarendon Eyre Brigadier 3rd
Walamba Precious Gem ..	Vol. 27	25.10.39	12½	4,148	5·11	212·02	230	Jr. 2	.. ..	Selsey Wonderful Boy
Crawford, Mrs. E., Traralgon, Jersey (5).										
Balniel Lake Empress ..	Vol. 27	11.10.39	10	4,290	5·49	235·53	230	Jr. 2	.. ..	Pine Grove Duke
Balniel Northwood Belle ..	60467	1.10.39	9	5,270	5·75	303·18	290	Sr. 3	153, 335 ..	Meldreth Norma's Improver
Balniel Princess Larkspur	Vol. 27	20.11.39	12	5,003	4·73	236·49	230	Jr. 2	.. ..	Werribee War Volunteer
Balniel Starbright ..	56234	20.11.39	10	5,030	5·57	280·22	270	Jr. 3	253 ..	Werribee War Volunteer
Balniel Valour's Starbright	56235	14.10.39	12	5,181	5·44	298·00	330	Sr. 4	225, 320 ..	War Valour (Imp.)
Daley, G. and M., Lilydale, Jersey (13).										
Beaus Fancy Daisy (Imp.)	46864	22.11.39	13	5,941	6·20	368·38	350	Mature	471 ..	Brampton Beau
Belgonia Design's Buttercup 5th	Vol. 27	27.9.39	17	5,191	6·16	319·68	230	Jr. 2	.. ..	Design's Ruler (Imp.)
Belgonia Design's Noella ..	42697	24.11.39	21	6,988	5·48	383·10	350	Mature	370, 462, 470, 479, 438, 369	Design's Ruler (Imp.)
Belgonia Design's Noella 3rd	60538	30.9.39	24	8,092	5·20	421·00	270	Jr. 3	320 ..	Duke of the Lake (Imp.)
Belgonia Design's Perree 2nd	56317	29.11.39	16	6,070	6·36	386·26	310	Jr. 4	317 ..	Design's Ruler (Imp.)
Belgonia Eileen 9th ..	Vol. 27	5.10.39	12	5,428	5·56	301·96	230	Jr. 2	.. ..	Aim High (Imp.)
Belgonia Gem's Noella 2nd	56320	26.10.39	14	6,926	5·90	408·86	350	Mature	360, 255 ..	Design's Ruler (Imp.)
Belgonia Marie 10th ..	Vol. 27	1.10.39	14	5,366	4·99	267·57	230	Jr. 2	.. ..	Aim High (Imp.)
Glen Iris Belle Anemone ..	Vol. 27	27.10.39	15½	8,220	5·12	420·74	270	Jr. 3	314 ..	Glen Iris Bowman
Glen Iris Golden Maid ..	39839	27.9.39	10	6,735	5·52	371·84	350	Mature	364, 375 ..	Rochettes Golden (Imp.)
Karrara Fancy Madeira ..	67354	29.9.39	30	11,491	5·68	652·24	270	Jr. 3	446 ..	Victorious Pioneer (Imp.)
Karrara Perree's Tecoma ..	67356	6.10.39	10	5,701	6·13	349·71	270	Jr. 3	313 ..	Springhurst Perree's Quality
Selsey Ricious 2nd ..	Vol. 27	27.9.39	14	5,688	5·65	321·36	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)

* 240 days in test (sold).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Dennis, Mrs., A. A., Frankston, Jersey (1).										
Ballam Lilac Domino ..	65286	27.11.39	17½	5,058	6·63	335·39	220	Jr. 2	.. ..	Clarendon Eyre Observer
Department of Agriculture, Burnley, Jersey (2).										
Victoria Flirt	33272	4.12.39	14	6,689	6·42	429·10	350	Mature	359, 390, 484, 485, 513, 517, 614	Victoria Jack Tar
Victoria Princess Betty ..	59873	2.10.39	29	8,846	5·16	456·41	270	Jr. 3	429 ..	Selsey Viola's Boy
Department of Agriculture, Werribee, Friesian (6).										
Victoria Actress	6072	27.11.39	15½	7,653	4·02	307·70	230	Jr. 2	.. ..	Rupertswood Inka Jo
Victoria Belle	6075	17.11.39	20½	10,169	3·39	344·31	230	Jr. 2	.. ..	Rupertswood Inka Jo
Victoria Mabel	6092	26.10.39	28	10,797	3·11	336·15	270	Jr. 3	335 ..	Victoria Double Top
Victoria Prima Donna ..	6096	24.12.39	19½	11,924	3·64	434·61	310	Jr. 4	414, 366 ..	Victoria Double Top
Victoria Rita	Vol. 14	3.10.39	19½	8,301	3·43	284·53	230	Jr. 2	.. ..	Rupertswood Inka Jo
Victoria Songbird ..	6098	7.11.39	10½	7,127	3·65	259·94	230	Jr. 2	.. ..	Rupertswood Inka Jo
Department of Agriculture, Werribee, Red Poll (14).										
Victoria Albatross ..	6707AA	2.11.39	6	6,501	4·34	281·91	290	Sr. 3	249 ..	Chandpara Valentine
Victoria Bessie	7009A	17.11.39	10	8,610	3·93	338·61	290	Sr. 3	316 ..	Woodburn Peter Pan
Victoria Bullfinch ..	6013A	13.10.39	6	7,841	4·41	345·59	330	Sr. 4	294, 266 ..	Victoria John Bull
Victoria Curlicue ..	4505AA	27.12.39	20	7,989	4·42	353·34	350	Mature	270, 349, 374	Victoria Gallant
Victoria Glint	7012A	4.11.39	15	6,591	4·22	278·27	230	Jr. 2	.. ..	Victoria Donald
Victoria Lady Petrina ..	6022A	16.11.39	10	10,020	4·11	412·12	330	Sr. 4	340, 381 ..	Woodburn Peter Pan
Victoria Maid Marion ..	5690AA	29.11.39	19	9,450	4·51	425·78	350	Mature	316, 437, 445	Woodburn Peter Pan
Victoria Pebble	6026A	2.11.39	4	7,792	4·34	337·83	330	Sr. 4	278, 313 ..	Woodburn Peter Pan
Victoria Philopena ..	6028A	21.11.39	19	8,318	3·95	328·68	330	Sr. 4	317, 366 ..	Woodburn Peter Pan
Victoria Royal Red Cross ..	4506AA	23.11.39	12	8,595	4·00	343·83	350	Mature	214, 304, 323, 295	Victoria Royal Ringer
Victoria Separation ..	3926A	16.11.39	15	10,952	3·93	429·90	350	Mature	215, 279, 333, 386, 381	Dominion Bright Belgian
Victoria Valeria	7028A	20.10.39	25	9,476	4·43	420·09	290	Sr. 3	315 ..	Chandpara Valentine
Victoria Volt	4049B	28.11.39	15	11,014	4·45	490·44	350	Mature	296, 369, 398, 515, 537, 512	Victoria Vice Captain
Victoria Whirlwind ..	7030A	1.11.39	25	9,717	4·20	407·66	270	Jr. 3	330 ..	Victoria Goblin
Dookie Agricultural College, Dookie, Ayrshire (1).										
Dookie Shirley's Lass ..	32244	25.12.39	20	7,056	3·72	262·62	270	Jr. 3	.. ..	Tregorland Indispensable
Eltringham, W. B., Wandin North, Jersey (1).										
Clifford Farm Marina ..	Vol. 27	17.10.39	19	6,912	5·87	405·53	230	Jr. 2	.. ..	Clifford Farm Danny Boy
Enders, N. H., Stanhope, Jersey (2).										
The Wattle's Hazel 3rd ..	64548	12.10.39	15½	8,342	4·95	413·21	270	Jr. 3	284 ..	The Wattle's Silver Gamboge
The Wattle's Petal 6th ..	69347	8.10.39	18	9,084	5·16	468·34	230	Jr. 2	.. ..	The Wattle's Silver Gamboge
Fadersen, J. H., Mandurang, Jersey (3).										
Banyule Silvermine 98th ..	51657	4.11.39	21½	7,545	5·09	384·34	310	Jr. 4	263 ..	Oxford Beau's Pretty Oxford (Imp.)
Grovelea May Morn ..	62016	23.12.39	13	6,217	4·86	301·86	330	Sr. 4	297 ..	Mornmoot Monarch 2nd
Grovelea Queen Bee ..	62017	6.11.39	11½	6,790	4·74	321·69	330	Sr. 4	277 ..	Mornmoot Monarch 2nd
Fairchild and Clutterbuck, Tinamba, Jersey (7).										
Carrellen Wyandotte ..	65881	16.11.39	17½	6,076	5·29	353·17	230	Jr. 2	.. ..	Darnum Park Lord Starbright
Keyuga Beth	47421	30.9.39	15	5,295	5·26	278·37	230	Jr. 2	.. ..	Keyuga Bold Pilot
Vaucluse Daphne 2nd ..	65922	22.12.39	11	5,763	5·08	292·76	270	Jr. 3	326 ..	Glen Iris Violin
Vaucluse Daphne 3rd ..	Vol. 27	31.10.39	18½	5,966	5·44	324·72	230	Jr. 2	.. ..	Glen Iris Violin
Vaucluse Kirsty 3rd ..	Vol. 27	29.10.39	18	5,499	5·53	303·95	230	Jr. 2	.. ..	Glen Iris Violin
Vaucluse Tinsel 3rd ..	Vol. 27	2.11.39	17¼	6,053	5·46	330·51	230	Jr. 2	.. ..	Paisley Master
Vaucluse Trilby	69525	4.11.39	19½	7,274	6·07	441·58	270	Jr. 3	326 ..	Glen Iris Violin
Fixter, A., Boisdale, Guernsey (1).										
Avonview Buttercup 2nd ..	6725	2.12.39	10½	5,365	5·41	290·23	270	Jr. 3	325 ..	Kentdale Monogram
Foster, A. O., Boisdale, Jersey (10).										
*Boisdale Birdie	51839	17.12.39	4	3,155	5·27	166·40	350	Mature	223, 215, 265	Boisdale Bruin 3rd
Boisdale Birdie 2nd ..	Vol. 27	18.11.39	10	4,492	5·46	245·28	270	Jr. 3	.. ..	Boisdale Masterpiece
Boisdale Brunette 5th ..	60686	15.12.39	11	4,753	5·25	249·73	290	Sr. 3	188 ..	Wompini Master Grey
Boisdale Butterfly 3rd ..	65508	28.10.39	6	3,768	6·12	230·69	250	Sr. 2	157 ..	Wompini Master Grey
Boisdale Butterfly 4th ..	Vol. 27	10.11.39	4	3,477	6·00	208·71	230	Jr. 2	.. ..	Boisdale Grey Night
Boisdale Dolly 3rd ..	Vol. 27	8.11.39	4½	3,539	5·94	210·36	230	Jr. 2	.. ..	Boisdale Masterpiece
Boisdale Goldfinch ..	51844	9.11.39	7½	4,978	5·84	290·79	350	Mature	193, 246, 280	Boisdale Dazzler
Boisdale Twilight 3rd ..	Vol. 27	27.11.39	8	4,069	5·55	225·84	230	Jr. 2	.. ..	Boisdale Masterpiece
Boisdale Twinkle 3rd ..	Vol. 27	9.12.39	8½	3,866	5·71	220·81	230	Jr. 2	.. ..	Boisdale Masterpiece
†Myrtleview Sweet Maid ..	41208	3.11.39	4	1,850	5·17	95·72	350	Mature	311, 284, 383, 256, 224	Summerhill Economist

* 210 days in test. † 120 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Fraser, G. A., Addington, Ayrshire (4).										
Bonnie Doon Bertha ..	26968	27.9.39	10½	7,907	4.49	355·16	350	Mature	257, 299, 354, 462	Glengowrie Masterpiece
Bonnie Doon Sedate ..	30213	4.10.39	8	6,430	4·07	261·57	290	Sr. 3	300 ..	Bonnie Doon Baronet
*Bonnie Doon Sunshine ..	30214	29.10.39	..	7,830	4·02	314·63	310	Jr. 4	341 ..	Bonnie Doon Baronet
†Bonnie Doon Wanda ..	31128	4.11.39	..	7,095	4·59	325·75	270	Jr. 3	380 ..	Glengowrie Jubilee
Gay, R. G. and Son, North Devon, Jersey (1).										
Elm Grove Silvershine ..	Vol. 27	25.10.39	12½	4,816	6·03	290·37	230	Jr. 2	.. ..	Gold Star of Melrose
Goddard, J. H., Cora Lynn, Ayrshire (2).										
Inverurie Hester ..	31544	17.10.39	20¾	11,777	5.02	591·75	270	Jr. 3	412 ..	Crescent Farm Amber
Inverurie Lydo Lady ..	30704	30.9.39	11	9,680	4·85	469·52	310	Jr. 4	299, 473 ..	Inverurie Laddie
Grice, C. S., Somerville, Jersey (1).										
Willis Vale L'Aiglon Capture	69715	10.10.39	15	6,900	5·43	374·94	250	Sr. 2	.. ..	Clarendon Eyre Eminent's L'Aiglon 6th
Handbury, J. E. and Son, Toora, Jersey (1).										
Tooravale Bettws-y-Coed ..	59761	30.10.39	26½	9,906	5·68	563·06	330	Sr. 4	402, 542 ..	Kyora Hero
Handley, S. C., Dandenong, Jersey (1).										
Barrowby Briar Rose ..	60508	21.12.39	29	8,262	4·97	411·06	290	Sr. 3	303, 424 ..	Barrowby Sonny
Harvey, T., Boisdale, Jersey (14).										
Jerseyholm Bluebell 13th ..	40371	25.10.39	15	6,611	4·96	328·17	350	Mature	281, 381, 371, 361, 334	Werribee Master's Fox
Jerseyholm Bluebell 17th ..	44478	20.10.39	9½	6,380	5·41	344·93	350	Mature	310, 346, 305	Werribee Master's Fox
Jerseyholm Bluebell 21st ..	53355	9.11.39	12	5,753	5·96	342·78	350	Mature	273, 338, 316	Werribee Master's Fox
Jerseyholm Bluebell 33rd ..	62305	10.11.39	13	5,804	5·11	296·74	270	Jr. 3	255 ..	Jerseyholm Master's Fox 35th
Jerseyholm Bluebell 34th ..	62306	12.11.39	13½	6,011	5·87	352·73	270	Jr. 3	300 ..	Mornmoot Mars
Jerseyholm Bluebell 37th ..	62308	16.11.39	16½	6,486	5·52	358·29	230	Jr. 2	.. ..	Banyule Biplane
Jerseyholm Bluebell 38th ..	67185	17.10.39	14	4,869	5·38	261·73	230	Jr. 2	.. ..	Banyule Biplane
Jerseyholm Bluebell 39th ..	67186	9.11.39	10½	6,239	5·33	332·29	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Bluebell 41st ..	67188	21.12.39	14½	5,234	5·44	284·99	230	Jr. 2	.. ..	Rowallan Silvanite
Jerseyholm Empress 22nd ..	37506	27.12.39	19	7,473	4·88	364·77	350	Mature	344, 419, 393, 380, 327, 340	Brucevale Lord Island Fancy
Jerseyholm Empress 42nd ..	53359	7.10.39	13½	6,738	5·71	384·77	350	Mature	331, 398, 380	Jerseyholm Master's Expert
Jerseyholm Empress 59th ..	67192	9.10.39	13½	4,241	5·41	229·29	230	Jr. 2	.. ..	Banyule Biplane
Jerseyholm Kirsty 38th ..	62316	14.12.39	15½	5,822	5·69	331·47	250	Sr. 2	282 ..	Jerseyholm Master's Fox 35th
Jerseyholm Lady Marge 17th	67197	15.11.39	18½	5,433	5·13	278·49	230	J,. 2	.. ..	Rowallan Silvanite
Haywood, Dr. A. R., Hastings, Jersey (6).										
Windrest Chevy's Beauty ..	Vol. 27	12.10.39	16½	6,358	5·93	377·15	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Chevy's Madeira	69731	12.12.39	15	5,400	5·69	307·49	270	Jr. 3	313 ..	Windrest Prince Madeira
†Windrest Island Star ..	69734	30.9.39	4	5,250	5·22	273·95	270	Jr. 3	321 ..	Gadget (Imp.)
Windrest Rose Marie 2nd ..	Vol. 27	20.10.39	9	4,919	6·44	316·62	270	Jr. 3	237 ..	Windrest Prince Madeira
Windrest Twinkle's Beautiful	Vol. 27	13.10.39	16	6,506	6.35	413·40	230	Jr. 2	.. ..	Gadget (Imp.)
Windrest Twinkle's Charm..	Vol. 27	5.10.39	16½	5,623	6·95	391·13	230	Jr. 2	.. ..	Gadget (Imp.)
Henderson W., Grasmere, Ayrshire (16).										
¶Carracoorte Balm 18th ..	27003	30.9.39	4	7,462	4·80	357·99	350	Mature	305, 236, 182	Carracoorte Gerty's Producer
‡Carracoorte Briar Bud 6th	32073	17.11.39	4	2,783	5·16	143·68	250	Sr. 2	.. ..	Carracoorte Belle's Victory
†Carracoorte Bunty 17th ..	24685	18.10.39	4	6,240	4·97	310·37	350	Mature	280, 450, 353, 363	Bluebell's Pride of Glencourt
Carracoorte Fennella 24th ..	32075	23.12.39	20	4,425	4·87	215·38	270	Jr. 3	.. ..	Grandview Bernie
†Carracoorte Iris 18th ..	24696	13.10.39	4	6,240	4·53	282·37	350	Mature	239, 410, 293, 352	Carracoorte Malden's Laddie
§Carracoorte Iris 35th ..	31194	12.12.39	4	4,607	4·13	190·37	310	Jr. 4	151 ..	Carracoorte Boomerang
‡Carracoorte Lucy 14th ..	24703	29.10.39	4	5,010	4·32	216·39	350	Mature	304, 340, 275, 245	Blue Bell's Pride of Glencourt
Carracoorte Muriel 2nd ..	32077	6.11.39	11	5,065	4·61	233·56	250	Sr. 2	.. ..	Grandview Bernie
Carracoorte Rhoda 2nd ..	32080	27.11.39	16	5,673	4·32	245·17	250	Sr. 2	.. ..	Carracoorte Boomerang
Carracoorte Sparkle 14th ..	32081	19.11.39	13	3,986	4·40	175·38	250	Sr. 2	.. ..	Carracoorte Boomerang
§Carracoorte Viola 28th ..	27014	10.10.39	4	5,650	4·72	266·57	350	Mature	288, 310, 342	Carracoorte Blue Bell's Favourite
¶Carracoorte Viola 39th ..	32082	14.12.39	4	2,340	4·51	105·45	230	Jr. 2	.. ..	Grandview Bernie
Hazelmore Balm 5th ..	31506	6.10.39	10¾	5,897	4·09	241·12	250	Sr. 2	.. ..	Carracoorte Botanist
†Hazelmore Viola 8th ..	31511	3.10.39	4	4,425	4·59	202·92	270	Jr. 3	.. ..	Carracoorte Botanist
Jennewar Cynthia ..	29670	8.10.39	7	6,606	4·27	282·07	350	Mature	210, 242 ..	Denbigh Ace
¶Rivery Park Necklace ..	26701	14.10.39	4	6,120	4·48	274·04	350	Mature	.. ..	Carracoorte Lucifer
Higgins, J. A. A., Keysborough, Guernsey (1).										
†Melbourne Golden Heroine	3660	24.11.39	4	3,900	4·28	166·79	350	Mature	.. ..	Yarraview Ronald

* 240 days in test (herd withdrawn. † 240 days in test. ‡ 180 days in test. § 250 days in test.
¶ 150 days in test. ¶ 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Hore, E., Leitchville, Jersey (2).										
Melvue Golden Duchess ..	58461	12.11.39	10½	8,000	4·73	378·62	350	Mature	328, 361, 383	Glen Iris Lord Viola 2nd
Troed-yr-Rhiw Cariad 2nd..	50927	9.11.39	16	7,683	5·39	413·84	350	Mature	360, 454, 523, 465, 430	Glen Iris Montrose Duke
Hore, L. G., Horfield, Illawarra Shorthorn (11).										
*Horfield Bluebell 7th ..	Vol. 7	16.11.39	4	5,400	3·41	184·28	270	Jr. 3	.. ..	Hillview Reliance
†Horfield Daisy 9th ..	Vol. 7	6.10.39	4	6,450	3·81	245·82	270	Jr. 3	.. ..	Hillview Reliance
*Horfield Della 4th ..	C.R.	26.10.39	4	6,045	3·33	201·34	270	Jr. 3	.. ..	Hillview Reliance
Horfield Fashion 2nd ..	16906	10.11.39	7	7,731	4·12	318·62	350	Mature	.. ..	Aralabrad Colma
*Melba 3rd of Horfield ..	16908	10.10.39	4	6,675	4·44	296·45	350	Mature	222 ..	Aralabrad Colma
*Horfield Melba 7th ..	20818	8.10.39	4	5,700	4·06	231·33	350	Mature	.. ..	Aralabrad Colma
Horfield Melba 17th ..	Vol. 7	8.11.39	4	5,592	4·63	258·72	250	Sr. 2	.. ..	Hillview Reliance
*Horfield Rita 3rd ..	20822	7.10.39	4	7,995	4·07	325·13	350	Mature	.. ..	Kimo Hero
*Horfield Rita 5th ..	Vol. 7	26.10.39	4	4,762	4·48	213·52	230	Jr. 2	.. ..	Hillview Reliance
Horfield Silkette 3rd ..	C.R.	25.12.39	9	6,465	3·59	232·11	230	Jr. 2	.. ..	Hillview Reliance
†Horfield Fashion 3rd ..	Vol. 7	9.11.39	4	5,235	4·03	211·06	290	Sr. 3	.. ..	Horfield Acrobat
Hore, M. T., Horfield, Friesian (8).										
Elmar Onia Beets ..	5458	9.10.39	4½	8,181	3·65	298·33	330	Sr. 4	339 ..	Greenvale Oakwood Posch
Elmar Bella	C.R.	20.10.39	21½	7,917	3·30	261·26	230	Jr. 2	.. ..	Elmar Sylvia's Lad
Elmar Florence	C.R.	7.10.39	25½	8,927	3·09	276·28	250	Sr. 2	.. ..	Elmar Sylvia's Lad
Elmar Frescolene ..	C.R.	23.10.39	41	15.528	3·31	514·02	350	Mature	371 ..	Elmar Sylvia's Lad
Elmar Pearl	C.R.	14.10.39	10½	6,950	3·52	244·75	230	Jr. 2	.. ..	Burnbank Iona Rock
Elmar Rosie	4526	15.10.39	13½	10,852	3·16	342·69	350	Mature	297, 350 ..	Greenvale Oakwood Posch
Elmar Rock Keyes ..	C.R.	20.10.39	20½	9,782	3·47	339·67	230	Jr. 2	.. ..	Burnbank Iona Rock
Elmar Sylvia	C.R.	12.12.39	20	9,062	3·51	317·67	310	Jr. 4	.. ..	Greenvale Oakwood Posch
Hubbard, A., Yarra Glen, Ayrshire (2).										
Emoh Ruo Maimee ..	32315	10.11.39	12	5,646	4·59	259·15	290	Sr. 3	.. ..	Fulham Fun
Emoh Ruo Pamella ..	31365	19.11.39	23½	7,615	3·95	300·71	310	Jr. 4	.. ..	Fulham Fun
Huffer, J. A., Gormandale, Jersey (3).										
Glenvalley Blossom ..	61862	28.9.39	14	6,987	5·82	406·52	310	Jr. 4	231, 377 ..	Glenvalley Sir Roger 2nd
Glenvalley Mercedes Fancy	Vol. 27	25.10.39	10	3,705	6·50	240·88	230	Jr. 2	.. ..	Yulebra Fancy Twylish 4th
‡Glenvalley Silvershine 3rd	Vol. 27	27.10.39	..	4,845	5·63	272·71	230	Jr. 2	.. ..	Brucevale Wyandotte's King
Hurrey, Estate of the late W. H., Koonwarra, Jersey (8).										
Burwood Cream Belle 4th ..	60927	6.10.39	10	5,895	6·53	384·65	310	Jr. 4	273, 338 ..	Kooreena Handsome Lad
Burwood Mourier Belle 2nd	60930	21.11.39	8½	4,331	6·72	291·05	310	Jr. 4	275, 337 ..	Kooreena Handsome Lad
Kooreena Audrey 7th ..	49031	6.12.39	5½	4,247	7·03	298·66	350	Mature	243, 435, 381, 426	Kooreena Carrie 3rd's Delegate
Kooreena Audrey 8th ..	49032	20.12.39	11	4,391	7·35	322·57	350	Mature	284, 384, 404, 435	Kooreena Carrie 3rd's Delegate
Kooreena Carrie 7th ..	58055	28.10.39	12½	6,534	6·43	420·03	350	Mature	279, 239, 378	Kooreena Carrie 3rd's Halo
Kooreena Miriam ..	67488	15.12.39	14	4,590	6·57	301·50	270	Jr. 3	244 ..	Kooreena Handsome Lad
Kooreena Tinkling Belle ..	Vol. 27	5.10.39	11½	5,713	6·85	391·27	230	Jr. 2	.. ..	Kooreena Rover 3rd
Kooreena Yo Yo 2nd ..	58059	14.12.39	17½	5,333	6·37	339·86	350	Mature	346, 361, 321	Kooreena Mourier King 2nd
Jones, A. C., Barnawartha, Illawarra Shorthorn (28).										
Aralabrad Bertha 5th ..	6641	5.10.39	10	6,915	4·33	299·58	350	Mature	303 ..	Headlight of Aralabrad
Aralabrad Nobleman's Champion	Vol. 7	11.10.39	11½	5,762	3·98	229·04	230	Jr. 2	.. ..	Aralabrad Nobleman
Coraldale Cherry 7th ..	10045	12.10.39	15½	7,585	4·22	320·24	350	Mature	.. ..	Berry Ignatius
Coraldale Cherry 11th ..	16012	27.11.39	18½	6,656	3·96	263·90	350	Mature	.. ..	Berry Ignatius
Coraldale Cherry 16th ..	Vol. 7	23.9.39	13½	6,746	4·31	290·97	250	Sr. 2	.. ..	Sunnyvale David
Coraldale Cherry 17th ..	Vol. 7	5.12.39	14	3,837	4·12	158·23	250	Sr. 2	.. ..	Sunnyvale David
Coraldale Cherry 20th ..	Vol. 7	5.11.39	11	4,903	3·75	183·69	230	Jr. 3	.. ..	Berry Ignatius
Coraldale Damsel 4th ..	10047	1.12.39	10	5,880	3·79	222·72	350	Mature	.. ..	Berry Ignatius
Coraldale Damsel 5th ..	10048	21.10.39	4½	6,479	4·40	285·16	350	Mature	.. ..	Berry Ignatius
Coraldale Damsel 13th ..	Vol. 7	12.10.39	14½	4,934	4·45	219·51	250	Sr. 2	.. ..	Sunnyvale David
Coraldale Fanny 3rd ..	6359	20.11.39	11	6,213	3·56	221·17	350	Mature	.. ..	Emblem of Coraldale
§Coraldale Fussy 5th ..	10051	16.11.39	4	3,855	4·12	158·96	350	Mature	.. ..	Berry Ignatius
Coraldale Melba 2nd ..	10053	14.12.39	15½	5,282	3·92	207·16	350	Mature	.. ..	Berry Ignatius
Coraldale Melba 3rd ..	16047	11.10.39	11½	6,297	3·99	251·34	350	Mature	.. ..	Berry Ignatius
Coraldale Melba 4th ..	16048	20.10.39	11	4,983	4·31	214·70	350	Mature	.. ..	Berry Joker
*Coraldale Scarlet 5th ..	10054	20.10.39	4	5,610	4·57	256·32	350	Mature	.. ..	Berry Ignatius
Coraldale Scarlet 9th ..	16050	31.10.39	17½	5,571	3·91	217·78	350	Mature	.. ..	Berry Ignatius
Coraldale Scarlet 10th ..	Vol. 7	20.10.39	8	5,049	4·14	208·82	290	Sr. 3	.. ..	Berry Ignatius
Coraldale Scarlet 11th ..	Vol. 7	4.12.39	10	4,530	4·06	183·78	270	Jr. 3	.. ..	Berry Ignatius
Maulvern Pride	Vol. 7	10.11.39	8½	4,601	3·71	170·92	230	Jr. 2	.. ..	Avondale Theo
The Forest Posy 6th ..	18258	28.11.39	9	4,602	4·66	214·31	350	Mature	.. ..	Despatch of the Forest
*The Forest Ruby 3rd ..	14548	10.10.39	4	8,220	4·41	362·76	350	Mature	.. ..	The Forest Goldmine
‖The Forest Tiny 7th ..	22776	6.10.39	4	6,615	4·23	279·61	350	Mature	303 ..	The Forest Goldmine
‖Wangoola Buttercup ..	Vol. 7	6.10.39	4	6,100	4·55	277·45	330	Sr. 4	286 ..	The Forest King 2nd
Wangoola Maggie ..	Vol. 7	28.10.39	16	6,960	4·19	291·29	270	Jr. 3	.. ..	Hillview Renown's Combination
Wangoola Renown's Tiny ..	Vol. 7	20.11.39	16	5,530	3·88	214·83	270	Jr. 3	.. ..	Hillview Renown's Combination
Wangoola Shamrock 5th ..	Vol. 7	27.10.39	16½	6,515	3·89	253·30	270	Jr. 3	.. ..	The Forest Posy's King
Wangoola Silvermine's Tiny	Vol. 7	29.9.39	12	6,209	3·98	246·91	250	Sr. 2	.. ..	The Forest Silvermine

* 240 days in test. † 210 days in test. ‡ 240 days in test. (sold). § 180 days in test. ‖ 245 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.		Sire.
Leask, G. C., Garfield, Ayrshire (5).											
Burghclere Iona Isis ..	32013	5.11.39	15½	6,317	4·31	272·55	230	Jr. 2	..	..	Gowrie Park Bonnie Jock
*Gowrie Park Ita ..	32486	14.10.39	4	5,325	4·38	233·38	250	Sr. 2	75	..	Fern Vale Top Notch
†Gowrie Park Luxurious ..	31479	25.10.39	4	5,678	3·85	218·56	270	Jr. 3	..	..	Fairview Bonnie King
Gowrie Park Nicety ..	32497	26.10.39	13	5,774	4·18	241·08	230	Jr. 2	..	..	Gowrie Park Minstrel
Burghclere Iona Bess ..	32012	21.11.39	10	5,110	4·10	209·28	230	Jr. 2	..	..	Gowrie Park Bonnie Jack
Le Noury, E., Werribee South, Guernsey (1).											
Cleveland Melody ..	6927	20.11.39	8½	5,609	5·06	284·05	270	Jr. 3	..	..	Melbourne Peter Pan
Lyon, C. G., Heidelberg, Jersey (6).											
Banyarra Attractions Madeira 2nd	47115	6.11.39	19½	7,557	6·16	465·87	350	Mature	296, 418, 377		Retford King Bracken
Banyule Ettie 18th ..	38706	20.10.39	13½	6,116	6·53	399·25	350	Mature	403, 435, 432		Banyule Triplane
Banyule Silvermine 119th ..	60504	17.11.39	22	6,903	5·77	398·27	230	Jr. 2	..	..	Banyule Triplane
Banyule Silvermine 120th ..	60505	11.11.39	15	5,066	5·47	277·23	230	Jr. 2	..	..	Banyule Comet
Kantara Wildflower ..	24582	27.12.39	34	9,779	5·18	506·75	350	Mature	377, 487, 441, 478		Ku Ku Fashion Plate (Imp.)
Rowallan Silvermine 5th ..	64129	27.10.39	15½	5,327	5·42	288·74	230	Jr. 2	..	..	Banyule Oxford Don
Macauley, C. W., Rochester, Jersey (2).											
Taranah Rainbow ..	42118	18.11.39	11½	6,353	5·36	340·35	350	Mature	428, 361, 354		Duke of Invermay
Taranah Rarity 3rd ..	69225	7.10.39	12	6,686	5·75	384·58	250	Sr. 2	320	..	Taranah Fair Boy
McCosh, S. J., Wandin North, Jersey (2).											
Heathermont Countess 2nd	66928	15.10.39	13	5,966	5·72	341·45	250	Sr. 2	..	..	Glen Valley Masterman
Mornmoot Modesty 5th ..	41128	2.10.39	10	5,360	5·10	273·29	350	Mature	362, 380, 378, 355, 266		Werribee Prince Madeira
McErvale, I. and Sons, Camperdown, Jersey (8).											
Cumnock Blue Bell ..	66122	22.10.39	15	6,707	5·20	348·73	270	Jr. 3	251	..	Cumnock Governor General
Cumnock Carson's Clementine	Vol. 28	5.11.39	14	4,589	4·77	218·78	270	Jr. 3	..	..	Staghorn Prince Clementine
Cumnock Cynthia ..	66124	20.10.39	10½	6,060	5·43	329·05	350	Mature	269, 256	..	Cumnock Fancy's Masterpiece
Cumnock Dream Girl ..	Vol. 28	28.9.39	12	5,443	5·66	307·95	230	Jr. 2	..	..	Staghorn Prince Clementine
Cumnock Delysia ..	61242	20.11.39	18	7,647	4·90	374·50	350	Mature	284, 251	..	Cumnock Fancy's Masterpiece
Cumnock Gem	Vol. 28	23.10.39	9	5,234	5·33	278·76	270	Jr. 3	192	..	Airlie Golden Lad
Cumnock Hope	66125	7.11.39	22½	6,149	5·73	352·28	270	Jr. 3	235	..	Airlie Golden Lad
Kyora Bettwys-y-Coed ..	26085	27.9.39	12	5,765	5·06	291·70	350	Mature	342, 327, 401, 453		Miama's Volunteer of Woodside
McNabb, G. A. and Son, Irrewillipe East, Jersey (2).											
Maxon Count's Pearl ..	45059	23.10.39	15	8,672	5·11	442·97	350	Mature	269, 342, 276, 333		Maxon Count Graceful
Maxon Linnacres Alsyke ..	63002	15.10.39	15	6,042	6·70	404·84	270	Jr. 3	193	..	Maxon Linnacre's Starbright 2nd
Maher, R. H., Tongala, Jersey (2).											
‡Rosemont Lady Fowler's 20th	C.R.	12.10.39	..	4,830	5·54	267·56	250	Sr. 2	206	..	Rosemont Volunteer
‡Rosemont Lady Fowler 14th	64057	24.10.39	..	6,795	5·49	373·03	310	Jr. 4	266	..	Rosemont Golden Emblem
Maloney, P. J., Tongala, Jersey (4).											
Belgonia Eileen 8th ..	Vol. 27	1.10.39	9	6,870	5·27	362·05	230	Jr. 2	..	..	Aim High (Imp.)
Belgonia Junette ..	38829	1.10.39	15	8,306	6·03	500·74	350	Mature	347, 434, 505, 480		Retford Glider
Belgonia Peggy 10th ..	38831	1.10.39	10	6,156	5·25	323·47	350	Mature	475, 473, 481, 421, 520		Aveley Rex
Belgonia Peggy 21st ..	Vol. 27	28.9.39	20	5,681	5·95	338·15	230	Jr. 2	..	..	Aim High (Imp.)
Mason, V. J., Ferntree Gully, Guernsey (1).											
Osmanie Patty	7713	21.10.39	25	7,982	5·55	442·83	230	Jr. 2	..	..	Yarraview Night March
Meaklin, Bros. Mooroopna, Dairy Shorthorn (6).											
Drumneil Daisy 3rd ..	C.R.	24.12.39	29½	8,519	3·76	320·01	270	Jr. 3	..	..	Willow Park Lustre 3rd
Drumneil Daisy 4th ..	Vol. 2E	6.10.39	20	8,111	3·55	288·12	230	Jr. 2	..	..	Willow Park Lustre 3rd
Drumneil Ida	Vol. 2E	1.11.39	21	8,612	4·23	364·63	250	Sr. 2	..	..	Willow Park Lustre 3rd
Drumneil Nellie	777E	27.11.39	19	8,775	4·19	367·87	350	Mature	..	..	Darbalara Bounty
Drumneil Princess 7th ..	Vol. 2E	19.10.39	19	7,998	3·93	314·36	230	Jr. 2	..	..	Willow Park Lustre 3rd
Drumneil Snowdrop 2nd ..	790E	5.11.39	15	9,216	4·12	379·53	350	Mature	..	..	Drumneil Bounty 2nd
Mitchell, R. H., Linton, Jersey (2).											
Clifford Farm Norma ..	61102	20.10.39	24	8,573	6·21	532·08	290	Sr. 3	375, 286	..	Wompini V.C.
Clifford Farm Viola ..	61103	16.10.39	12	7,326	5·47	400·71	290	Sr. 3	317	..	Wompini V.C.
Moore, J. and Co., Yarram, Jersey (1).											
Tooloonook Virginia 6th ..	C.R.	27.10.39	4	3,419	5·14	175·70	230	Jr. 2	..	..	Belgonia Lady's Duke

* 210 days in test. † 240 days in test. ‡ 240 days in test (herd withdrawn).

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Nancarrow Bros., Kerang. Jersey (5).										
Bellaire Molly 8th ..	37975	27.10.39	20	10,970	5·33	585·05	350	Mature	422, 430, 479, 539, 552, 460, 501	Werribee Fancy Clementine's King
Pine Ridge Dream Girl 3rd	68645	25.10.39	17	5,694	4·79	272·51	230	Jr. 2	.. ..	Duke of The Lake (Imp.)
Pine Ridge Dream Girl 4th	68646	26.10.39	27	8,111	4·99	404·39	230	Jr. 2	.. ..	Duke of The Lake (Imp.)
Pine Ridge Duchess 3rd ..	68647	28.10.39	11	7,406	5·63	417·22	250	Sr. 2	398 ..	Duke of The Lake (Imp.)
Pine Ridge Rose Dream ..	63732	8.11.39	23½	8,500	4·72	401·39	290	Sr. 3	241, 408 ..	Duke of The Lake (Imp.)
Nicholas, M. A., Sherbrooke, Jersey (6).										
Brampton Standard Dream 2nd (Imp.)	56047	18.10.39	16	8,594	5·90	507·26	350	Mature	358, 384, 431	Brampton Sporting Standard (Imp.)
Selsey Fancy Wyandotte ..	64219	9.10.39	11	6,431	5·38	346·03	250	Sr. 2	322 ..	Selsey Great Master
Selsey Golden Rose ..	69062	17.10.39	14	5,934	5·43	322·11	230	Jr. 2.	.. ..	Samares Golden Prince (Imp.)
Selsey Princess Wyandotte	64223	18.11.39	17	6,077	6·42	390·39	270	Jr. 3	382 ..	Selsey Brampton Boy
Selsey Roseleaf 3rd ...	59413	7.10.39	10	5,834	5·13	299·16	290	Sr. 3	335, 308 ..	Brampton Great Boy (Imp.)
Selsey Samares Wyandotte	69071	4.10.39	16½	7,143	5·69	406·58	230	Jr. 2	.. ..	Samares Golden Prince (Imp.)
Noble, T. M. and Sons, Maffra, Jersey (11).										
Finchley Handsome Girl 2nd	66458	22.10.39	15	5,215	6·60	344·14	230	Jr. 2	.. ..	Finchley Vasilika's Masterpiece
Finchley Lady Peerless 3rd	61607	16.12.39	18	7,312	6·43	470·46	290	Sr. 3	411 ..	Finchley Masterman
Finchley Lillian 2nd ..	61608	23.11.39	20	8,207	5·39	442·11	350	Mature	335, 432 ..	Werribee Lord Burnham
Finchley Master's Canary ..	52727	10.10.39	20	8,655	6·52	563·99	350	Mature	388, 477, 481, 470	Finchley Masterman
Finchley Master's Canary 3rd	61610	21.12.39	16	6,693	6·66	445·95	270	Jr. 3	348 ..	Finchley Vasilika's Masterpiece
Finchley Music 5th ..	61611	15.12.39	15	7,977	5·91	471·25	310	Jr. 4	444, 509 ..	Finchley Vasilika's Masterpiece
Finchley Nasturtium 2nd ..	61612	19.10.39	22	8,663	5·43	470·57	350	Mature	361, 403, 464, 504	Werribee Lord Burnham
Finchley Nasturtium 8th ..	66462	13.10.39	18	6,279	5·69	357·28	230	Jr. 2	.. ..	Werribee Lord Burnham
Finchley Nasturtium 9th ..	66463	8.11.39	18	6,174	6·19	382·33	230	Jr. 2	.. ..	Finchley Masterman
Selsey Myrtle	64222	20.10.39	13	8,141	5·59	454·93	270	Jr. 3	321 ..	Brampton Great Boy (Imp.)
Sweet Comet (Imp.) ..	33960	7.10.39	18	7,359	5·84	429·73	350	Mature	332 ..	Mayfield King
O'Neill, J., Echuca Village, Jersey (2).										
Ullina Heather	64692	1.11.39	8½	5,942	5·96	354·35	310	Jr. 4	282, 358 ..	Ballara Fancy King
Ullina Princess Rose ..	Vol. 27	21.10.39	13	6,324	5·62	355·18	230	Jr. 2	.. ..	Melrose Outlook
Parks, E. F., Merton, Jersey (1).										
Irona Dreaming Cowslip ..	Vol. 27	7.10.39	5	4,800	5·49	263·30	230	Jr. 2	.. ..	Hamptonne Dreamer's Star
Pattison, F., Tongala, Ayrshire (10).										
Willow Park Ada ..	C.R.	17.12.39	10	8,272	4·14	342·39	270	Jr. 3	244 ..	Fulham Beam
Willow Park Amy ..	23342	13.12.39	15	9,081	4·02	365·23	350	Mature	273, 332, 341, 326, 316, 442	Willow Park Prince
Willow Park Jeanette ..	31007	20.12.39	12	8,726	4·21	367·42	350	Mature	343, 393 ..	Fulham Beam
Willow Park Lady ..	24457	11.12.39	11	8,247	4·00	329·89	350	Mature	290, 354, 346, 366, 358	Willow Park Prince
Willow Park Lily ..	26807	24.11.39	9	9,186	3·85	353·93	350	Mature	280, 296, 316, 332, 338	Willow Park Prince
Willow Park Maureen ..	31840	15.11.39	7	7,817	4·52	353·44	270	Jr. 3	322 ..	Fulham Beam
*Willow Park Pauline ..	C.R.	11.12.39	4	6,435	4·71	303·14	270	Jr. 3	290 ..	Fulham Beam
Willow Park Queenie ..	31010	18.11.39	6	8,019	4·40	352·75	310	Jr. 4	296, 290 ..	Willow Park Prince
Willow Park Rosie ..	23344	10 12.39	13	8,568	3·43	294·13	350	Mature	248, 308, 349, 374, 341, 365, 362	Willow Park Prince
*Willow Park Princess ..	26809	27.12.39	4	7,447	3·77	280·67	350	Mature	270, 297, 285, 351	Willow Park Prince
Payne, A. E. T., Lilydale, Guernsey (3).										
Clara's Fashion 7th (Imp.)	6652	11.11.39	36	12,566	4·45	558·61	350	Mature	400, 439, 493, 663	Sunrise of Maple Lodge
Nundorah Golden Daffodil 2nd	2814	29.11.39	26	11,457	4·49	514·45	350	Mature	390, 396, 562	Nundorah Golden Sovereign
Yarraview Flirt	8207	7.11.39	21	6,618	5·07	335·52	230	Jr. 2	.. ..	Yarraview Sunbird
Phillips, J. H., Swan Hill, Jersey (5).										
Ryelands Golden Glory ..	Vol. 27	24.12.39	8½	5,287	5·08	268·49	250	Sr. 2	212 ..	Bannaview Master
Ryelands Lavona ..	C.R.	9.10.39	13	6,131	5·50	336·94	230	Jr. 2	.. ..	Bannaview Master
Ryelands Rosy Morn ..	C.R.	8.10.39	13	5,366	4·71	252·99	230	Jr. 2	.. ..	Bannaview Master
Ryelands Sweet Lavender ..	59362	29.10.39	11	6,320	5·34	337·55	330	Sr. 4	232, 246, 298	Orphanage Zafferine's Prince
Ryelands Vanilla ..	C.R.	15.10.39	13	5,351	5·57	298·11	230	Jr. 2	.. ..	Bannaview Master

* 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class	Previous Yields of Butter Fat.	Sire.
Powell, Mrs. K. E., Bacchus Marsh, Jersey (7).										
Mount Violet Countess Rosalie	63237	4.11.39	10½	4,166	5·62	234·24	310	Jr. 4	.. ..	Woodside Silver Count
Mount Violet Lady Rochette	Vol. 27	24.10.39	10½	5,063	6·33	320·63	230	Jr. 2	.. ..	Mount Violet Kyeema's You'll Do
Mount Violet Maid Rochette	68126	12.10.39	11	6,270	4·88	306·18	270	Jr. 3	.. ..	Woodside Silver Count
Mount Violet Miss Mighty ..	C.R.	14.10.39	10	4,689	5·79	271·35	230	Jr. 2	.. ..	Woodside Silver Count
*Mount Violet Mistress ..	C.R.	11.11.39	..	4,245	7·20	305·45	230	Jr. 2	.. ..	Woodside Silver Count
Mount Violet Rose Marie	C.R.	25.11.39	9	5,067	6·04	306·05	230	Jr. 2	.. ..	Mount Violet Kyeema's You'll Do
Mount Violet Ruby Rochette	C.R.	2.11.39	10½	4,425	5·75	254·40	230	Jr. 2	.. ..	Mount Violet Kyeema's You'll Do
Powell, T. S., Mansfield, Jersey (2).										
Mornmoot Clementine 3rd	54243	3.11.39	14	5,652	5·41	305·93	330	Sr. 4	407, 444, 487	Werribee Madeira's Ace
Navuloa Master's Encore ..	68279	27.11.39	18	6,975	5·21	363·39	310	Jr. 4	386 ..	Werribee Grandmaster
Prince, Mrs. H. A., Swan Hill, Jersey (3).										
Pine Ridge Dream Girl 2nd	68644	16.10.39	23	8,899	5·60	498·69	250	Sr. 2	386 ..	Duke of the Lake (imp.)
Pine Ridge Molly 4th ..	Vol. 27	16.12.39	22	8,035	5·77	463·94	230	Jr. 2	.. ..	Pine Ridge Golden Duke
Rutland Monica	46104	18.12.39	13	8,273	5·75	475·79	350	Mature	.. ..	King's Vale Monica 23rd's Lad
Prout, A. P., Leongatha, Jersey (1).										
Five Gums Primula 10th ..	57284	18.10.39	11	6,098	5·61	342·31	350	Mature	.. ..	Werribee Alanda
Raggatt, F., Tongala, Jersey (3).										
Ivinghoe Buttercup 20th ..	Vol. 27	13.12.39	18	6,879	5·42	373·13	350	Mature	.. ..	Ivinghoe Starbright's Masterpiece
Strathbow Heather Belle 9th	69159	10.10.39	10	5,361	6·30	337·59	230	Jr. 2	.. ..	Tooravale Arbitrator
Weir View Golden Greetings 3rd	69650	11.10.39	11	5,714	5·01	286·36	230	Jr. 2	.. ..	Weir View Golden Duke
Read, Estate of the late J. D. Springhurst, Jersey (2).										
Springhurst Golden Anemone	64279	13.10.39	10½	4,458	4·97	221·45	230	Jr. 2	.. ..	Design's Golden Oxford (Imp.)
Springhurst Phillidora's Tulip	69128	15.11.39	9	4,002	5·59	223·73	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Richardson, W. S., Bacchus Marsh, Jersey (2)										
Clarendon Eyre Rose Marie 5th	43392	24.10.39	15	6,030	6·01	362·70	350	Mature	402, 418, 337, 301	Clarendon Eyre Eminent's Achievement
Sutton Lea Pariel 5th ..	64398	4.10.39	17	6,680	4·98	332·83	290	Sr. 3	183 ..	Staghorn Prince Aidan
St. Joseph's Home, Sebastopol, Jersey (4).										
Belgonia Design's Peerce 4th	60540	30·11·39	18	5,766	5·63	324·53	270	Jr. 3	.. ..	Duke of the Lake (Imp.)
Lipook Gloria	62814	11.10.39	12½	7,028	5·35	376·00	350	Mature	.. ..	Lipook Golden Noble
Lipook Hazel	Vol. 27	26.10.39	15	5,765	5·06	291·43	230	Jr. 2	.. ..	Marfield Joker
St. Joseph's Golden Princess	69044	30.11.39	12	5,120	5·37	275·05	250	Sr. 2	.. ..	Lipook Goldfinder
Salesian College, Sunbury, Fresian (6).										
Braemore Princess Domino 7th	5303	26.11.39	16½	9,770	4·00	391·17	350	Mature	381,612 ..	Turepo Prince Domino (Imp.)
Elgin Glen Ashlynn ..	4524	7.10.39	24½	16,214	3·35	543·20	350	Mature	354, 280, 526, 552, 580	Burnbank Majoe Dutchman
Glenloth View Dekol ..	5494	22.12.39	33	17,169	3·87	664·02	350	Mature	683 ..	Roads End Cato
†Ingolston Milkmaid ..	4101	3.10.39	4	10,635	3·67	389·96	350	Mature	380, 285, 275, 443, 565	Greenvale Ideal Segis
Rupertswood Agnes ..	C.R.	21.10.39	18	8,472	3·65	309·12	250	Sr. 2	.. ..	Rupertswood Henry
Rupertswood Cordyline Josie	5943	6.12.39	10	12,210	3·38	413·15	310	Jr. 4	346 ..	Rupertswood Dorotheus
Sambell, A. K. T., Phillip Island, Dairy Shorthorn (6).										
Braelands Pearl Roan 28th	Vol. 2	14.10.39	10½	9,178	3·66	336·14	310	Jr. 4	.. ..	Morven Lord Cressida 4th
Trenavin Park Killara ..	Vol. 2	3.11.39	18½	9,705	3·29	319·69	270	Jr. 3	.. ..	Wicklesham Lord Barrington 5th (Imp.)
Trenavin Park Rosebloom	Vol. 2	28.10.39	20½	9,496	4·15	394·10	350	Mature	.. ..	Braelands 150th Earl of Pentlands
Willow Park Duchess 22nd	1282E	5.10.39	16½	11,966	4·01	483·42	350	Mature	325 ..	Willow Park Imperial 3rd
Willow Park Melba 16th ..	1316E	1.11.39	18½	9,617	3·62	347·67	350	Mature	.. ..	Willow Park Lustre 3rd
Willow Park Queenie 33rd	1361E	24.10.39	7½	9,151	3·63	332·41	350	Mature	289, 363, 328	Willow Park Imperial 3rd
Shearman, A. and W., Darnum, Jersey (2).										
Clarendon Eyre Pinafore 11th	65951	24.12.39	22	6,950	5·61	389·56	310	Jr. 4	306, 396 ..	Clarendon Eyre Oxford Dreamer
Darnum Park Primrose ..	C.R.	14.10.39	5½	4,471	5·61	250·76	250	Sr. 2	.. ..	Darnum Park Leonie's Attraction
Shearn, J., Jindivick, Jersey (3).										
Jindivick Boronia ..	67223	8.11.39	8	3,984	6·21	247·48	230	Jr. 2	.. ..	Somerville Nobleman
Somerville Primose 2nd ..	Vol. 27	5.10.39	10	4,905	6·63	325·25	230	Jr. 2	.. ..	Brampton Pioneer Chut (Imp.)
Somerville Rosebloom 2nd	Vol. 27	27.11.39	4	3,942	5·53	217·81	250	Sr. 2	.. ..	Brampton Pioneer Chut (Imp.)

* 240 days in test (herd withdrawn). † 210 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Smith Bros., Mirboo North, Jersey (9).										
Sylvan Hill Alma 2nd ..	Vol. 27	27.10.39	7½	4,485	5·86	262·77	230	Jr. 2	.. ..	Glen Iris Bow Bells
Sylvan Hill Beauty 2nd ..	64403	28.9.39	10½	5,462	6·18	337·44	290	Sr. 3	303, 365 ..	Glen Iris Bow Bells
Sylvan Hill Gaypiece ..	69186	15.11.39	10½	6,122	5·43	332·39	270	Jr. 3	266 ..	Glen Iris Bow Bells
Sylvan Hill Lady Bells ..	64408	28.10.39	10½	5,852	6·58	384·84	310	Jr. 4	282, 350 ..	Glen Iris Bow Bells
Sylvan Hill Lotus ..	55380	10.11.39	12	5,519	5·58	307·86	350	Mature	228, 288, 239, 299	Jerseyholm Handsome Boy 3rd
*Sylvan Hill Noble Maid ..	69191	30.10.39	4	3,892	6·22	242·24	270	Jr. 3	262 ..	Glen Iris Bow Bells
*Sylvan Hill Sunflower ..	46307	15.10.39	4	6,195	6·13	380·03	350	Mature	316, 423, 375, 403, 470	Somerville Heir Apparent
*Sylvan Hill Sweet Maid ..	69192	8.12.39	4	4,815	6·08	292·69	270	Jr. 3	241 ..	Glen Iris Bow Bells
*Sylvan Hill Vanilla ..	69194	15.12.39	4	4,830	5·57	269·23	270	Jr. 3	226 ..	Glen Iris Bow Bells
Smith, C. G., Packenham, Jersey (2).										
Wonga Park Highland Lassie	Vol. 27	30.10.39	17	6,021	5·73	344·76	230	Jr. 2	.. ..	Wonga Park Twylish Lad
Wonga Park Songbird ..	Vol. 27	18.10.39	16½	6,648	6·07	403·76	230	Jr. 2	.. ..	Wonga Park Minx's Ace
Smith, R. W., Murraydale, Friesian (7).										
Ingolston Ideal Beauty 2nd	4719	6.10.39	22	13,882	3·28	454·95	350	Mature	.. ..	Greenvale Ideal Segis
Wattle Bank Cremona 3rd	C.R.	30.11.39	22	9,335	3·94	368·02	250	Sr. 2	.. ..	Hengest Lizzie Segis
Wattle Bank Fairy ..	App. I. Vol. 13	22.10.39	21	12,068	3·02	362·83	350	Mature	.. ..	Greenvale Wooderest Oakwood 2nd
Wattle Bank Mercedes Queen	6114	4.11.39	22	10,668	3·08	328·51	290	Sr. 3	.. ..	Hengest Lizzie Segis
Wattle Bank Primrose ..	6115	20.11.39	21	11,894	3·49	415·54	350	Mature	.. ..	Warwick Leonora Plebe
Wattle Bank Primrose 3rd	6117	12.10.39	21	10,965	3·27	358·57	230	Jr. 2	.. ..	Wattle Bank Segis De Kol
Wattle Bank Segis Jessie	6123	10.10.39	26	13,496	3·17	427·38	310	Jr. 4	.. ..	Hengest Lizzie Segis
Stephens, Dr. F. G., Vermont, Guernsey (3).										
Bangalam Vale Fairy ..	3975	3.10.39	27	9,302	4·76	442·55	350	Mature	332, 356, 341, 408	Minamurra Sequal Slogan
†Road's End Antoinette ..	3409	24.12.39	...	4,020	4·94	198·44	350	Mature	398, 340, 303	Glenburnie Ideal (Imp.)
Vermont Una's Princess ..	5188	16.10.39	26	9,963	4·80	478·59	350	Mature	339, 407, 279	Camellias Majestic 2nd of Maple Lodge
Tandberg, G. and Son, Warragul, Illawarra Shorthorn (2).										
‡Inverlair Heather ..	16958	25.12.39	..	7,230	4·17	301·61	350	Mature	.. ..	Tango of Greyleigh
Inverlair Grace 2nd ..	16957	1.11.39	13	8,057	4·53	391·78	350	Mature	.. ..	Tango of Greyleigh
Thomas and Taylor, Hamilton, Ayrshire (3).										
§Carracoorte Bunty 16th ..	24684	11.10.39	4	8,467	4·87	412·33	350	Mature	295, 384, 353, 422, 417	Carracoorte Pilot
Carracoorte Lillian 7th ..	27012	10.12.39	26	6,828	5·64	384·91	350	Mature	341, 292, 330, 426	Carracoorte Panic
Jennewar Beauty ..	30709	14.10.39	6	8,363	4·29	358·57	330	Sr. 4	290, 329 ..	Denbigh Ace
Tomasetti, B. G., Drouin West, Ayrshire (7).										
Alvaston Audrey ..	31922	23.12.39	19	6,546	4·33	283·67	250	Sr. 3	203 ..	Cathcart Masterpiece
Glencorrin Gracie ..	31415	19.11.39	30	10,481	4·60	481·96	310	Jr. 4	309, 363 ..	Tregorland King
Glencorrin Marigold ..	27245	21·10·39	24	11,484	3·84	441·37	350	Mature	337, 285, 351, 380	Scotswood Flashlight
Glencorrin Precious ..	C.R.	28.11.39	9½	4,788	4·60	220·40	230	Jr. 2	.. ..	Scotswood Flashlight
Glencorrin Quality ..	C.R.	30.11.39	12	8,040	4·26	342·28	270	Jr. 3	222 ..	Denbigh Gold King
Glencorrin Vera ..	C.R.	19.10.39	17	6,609	4·26	281·76	230	Jr. 2	.. ..	Scotswood Flashlight
Glencorrin Vesta ..	32416	2.10.39	18	6,959	4·22	293·39	230	Jr. 2	.. ..	Glenfalloch Pilot
Trevaskis, F. T., Tongala, Jersey (3).										
Ballara Dainty 4th ..	60444	26.10.39	..	6,007	5·33	319·91	250	Sr. 2	315 ..	Kyora Dream's Gadget 2nd
Ballara Dainty 3rd ..	60443	11.10.39	7½	4,748	5·77	273·83	250	Sr. 2	263 ..	Kyora Dream's Gadget 2nd
Ballara Romany Queen 2nd	65299	25.10.39	5	4,265	5·76	245·76	230	Jr. 2	.. ..	Kyora Dream's Gadget 2nd
Trewin, J. V., Nathalia, Jersey (1).										
Belgonia Blossom 7th ..	29112	30.10.39	12	7,694	4·67	359·67	350	Mature	474, 484, 411, 437	Aerial of Banyule
Vagg, E. J., Leongatha, Jersey (4).										
Bonnay Love's Darling .	Vol. 27	18.10.39	14	5,207	5·60	291·60	230	Jr. 2	..	Bonnay Edith's Masterstrain
Bonnay Tulips Evelyn ..	65542	23.10.39	15	5,952	6·27	373·29	270	Jr. 3	331 ..	Jerseyinn Edith's Masterpiece
Bonnay Tulips Judith ..	Vol. 27	13.12.39	20	6,210	5·27	327·10	230	Jr. 2	.. ..	Bonnay Edith's Masterstrain
Bonnay Sweet Alice ..	65541	2.11.39	18	6,219	5·42	336·92	270	Jr. 3	306 ..	Jerseyinn Edith's Masterpiece
Vaughan, Bros., Girgarre, Jersey (11).										
Lynroy Beta 2nd ..	C.R.	1.12.39	13	6,542	5·47	358·00	310	Jr. 4	296, 355 ..	Werribee Laverock
Lynroy Beta 3rd ..	C.R.	1.10.39	14	5,109	6·01	307·08	230	Jr. 2	.. ..	Werribee Laverock
Lynroy Fay	67740	4.10.39	17	7,224	6·13	442·62	250	Sr. 2	283 ..	Werribee Laverock
Lynroy Garnet 2nd ..	Vol. 27	1.10.39	18	6,446	5·93	382·18	230	Jr. 2	.. ..	Werribee Laverock

* 240 days in test. † 150 days in test. ‡ 240 days in test (sold). § 250 days in test. ‖ 247 days in test (herd withdrawn).

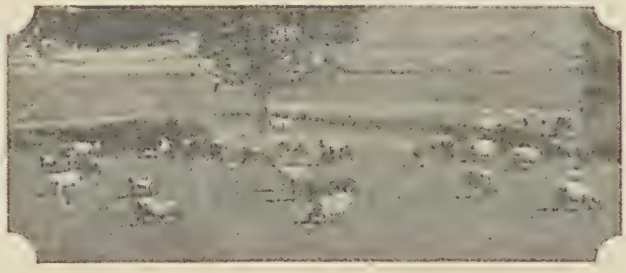
Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Vaughan Bros. Girgaree, Jersey (11)—*continued.*										
Lynroy Glad Eye ..	67741	5.12.39	20	7,723	5·81	448·38	310	Jr. 4	331 ..	Werribee Laverock
Lynroy Jasmine ..	58251	1.10.39	16½	7,212	5·94	428·09	350	Mature	367, 425, 291, 408	Werribee Laverock
Lynroy Jill	Vol. 27	3.10.39	22	8,131	5·81	472·81	250	Sr. 2	331 ..	Werribee Laverock
Lynroy Nancy's Belle ..	Vol. 27	6.10.39	17	5,796	5·88	340·88	230	Jr. 2	.. ..	Werribee Laverock
Lynroy Natty 2nd ..	62871	1.10.39	16	6,195	5·75	355·98	310	Jr. 4	359 ..	Werribee Laverock
*Lynroy Princess Gladys ..	67742	1.11.39	4	3,360	5·61	188·43	350	Mature	368, 476, 346	Werribee Laverock
Lynroy Valmai 2nd ..	Vol. 27	3.10.39	15	5,790	5·50	318·71	230	Jr. 2	.. ..	Werribee Laverock
Wade, W. J., Stratford, Jersey (3).										
Inverbroom Empress 6th ..	57761	27.10.39	11	7,205	5·76	415·00	290	Sr. 3	277, 291 ...	Economist of Aveley
Inverbloom Silver Muriel 2nd	38483	18.12.39	9	6,210	4·44	275·58	350	Mature	346, 379, 433, 419, 401, 370, 387	Economist of Aveley
Inverbloom Empress 7th ..	67090	5.10.39	9	4,707	6·40	301·48	230	Jr. 2	.. ..	Banyule Airport
Walker, C. S., Swan Hill, Friesian (1).										
Warwick Matador's Violet	C.R.	27.12.39	22	9,768	3·81	371·78	270	Jr. 3	294 ..	Hengest Matador Walker
Walker, C. S., Swan Hill, Jersey (12).										
Clarendon Eyre Happy Days 6th	65945	18.11.39	21	7,578	5·02	380·20	270	Jr. 3	287 ..	Clarendon Eyre Eminent's Lohengrin
Clarendon Eyre Love Lies 7th	65948	13.10.39	27¼	8,171	5·11	417·49	270	Jr. 3	366 ..	Clarendon Eyre Ruddigore 5th
Grangelea Rose 5th ..	48525	11.10.39	10½	7,417	4·42	327·84	350	Mature	309, 366, 361, 297	Banyule Macon
Grangelea Rose Petal 2nd	53022	3.12.39	20	7,121	6·37	453·67	350	Mature	321, 371, 288	Grangelea Cream Boy
Staghorn Cello 3rd ..	64291	20.10.39	13	5,844	5·98	349·57	310	Jr. 4	310, 333 ..	Staghorn Lord Aldan
Warwick Augustus Marie ..	38486	30.10.39	28	9,038	4·46	403·48	350	Mature	339, 433, 348, 379, 337, 398, 368, 412	Chevrolet of Banyule
Warwick Augustus Marie 6th	69625	14.10.39	20	6,857	5·13	351·56	270	Jr. 3	276 ...	Warwick Golden Lord
Warwick Beauty 6th ..	64825	10.10.39	17	7,832	5·09	398·57	290	Sr. 3	225, 306 ..	Warwick Golden Lord
Warwick Beauty 7th ..	C.R.	19.12.39	19½	4,812	5·09	244·75	230	Jr. 2	.. ..	Warwick Golden Lord
Warwick Cream Stockings 3rd	69628	6.10.39	21	7,686	5·35	410·84	270	Jr. 3	314 ..	Warwick Golden Lord
Warwick Polly 6th ..	C.R.	8.11.39	23	8,985	5·19	466·25	330	Sr. 4	336 ..	Glen Iris Golden Lord
Warwick Polly 10th ..	64826	7.10.39	28	8,775	5·52	484·05	290	Sr. 3	327, 348 ..	Glen Iris Golden Lord
Wallace, A., Dingee, Jersey (24).										
Grovelea Bonnie Girl ..	62014	31.10.39	7	4,651	5·12	238·34	310	Jr. 4	.. ..	Mornmoot Monarch 2nd
Grovelea Bright Star ..	57602	29.11.39	9	4,949	5·29	261·95	330	Sr. 4	129 ..	Mornmoot Monarch 2nd
Grovelea Busy Bee ..	44229	25.10.39	6	5,718	4·30	245·91	350	Mature	283, 239 ..	Thornbury Bonnie Boy
Grovelea Golden May ..	Vol. 27	21.12.39	8	4,059	4·79	194·46	230	Jr. 2	.. ..	Grovelea Golden Boy
Grovelea Golden Morocco	Vol. 27	19.11.39	5	3,868	4·72	182·58	230	Jr. 2	.. ..	Kenlock Golden Monarch
Grovelea Golden Snow ..	Vol. 27	22.11.39	4	3,374	5·86	197·76	230	Jr. 2	.. ..	Grovelea Golden Boy
Grovelea Modesty ..	66856	29.9.39	9	4,963	5·65	280·32	310	Jr. 4	.. ..	Mornmoot Monarch 2nd
Grovelea Monarch's Belle	Vol. 27	6.12.39	4	3,764	5·15	193·98	230	Jr. 2	.. ..	Grovelea Monarch
†Grovelea Monarch's Flower	Vol. 27	6.11.39	4	2,550	5·45	139·03	230	Jr. 2	.. ..	Grovelea Monarch
Grovelea Morocco's Queen	66859	8.12.39	6	3,530	5·01	176·89	310	Jr. 4	.. ..	Mornmoot Monarch 2nd
Grovelea Ranger's Bee ..	66860	22.12.39	5	4,657	4·60	214·36	270	Jr. 3	.. ..	Orphanage Ranger
Grovelea Ranger's Daffodil	66862	28.10.39	7	5,078	4·66	236·78	270	Jr. 3	.. ..	Orphanage Ranger
Grovelea Ranger's Flower	66863	16.12.39	5	4,385	4·65	204·09	290	Sr. 3	.. ..	Orphanage Ranger
Grovelea Ranger's Joybell	66864	21.10.39	5	4,842	4·90	237·17	270	Jr. 3	.. ..	Orphanage Ranger
Grovelea Ranger's Model ..	66865	27.10.39	7	4,343	5·33	231·40	270	Jr. 3	.. ..	Orphanage Ranger
Grovelea Ranger's Rosella	66866	7.10.39	9	4,379	5·60	245·43	270	Jr. 3	.. ..	Orphanage Ranger
Grovelea Rochette's Bee ..	Vol. 27	13.12.39	4	4,177	4·37	182·34	230	Jr. 2	.. ..	Mount Violet Rochette's Volunteer
Grovelea Rochette's Carmen	Vol. 27	13.10.39	4	5,277	4·22	222·64	230	Jr. 2	.. ..	Mount Violet Rochette's Volunteer
Grovelea Rochette's Lady	Vol. 27	26.11.39	10	4,309	4·73	203·96	230	Jr. 2	.. ..	Mount Violet Rochette's Volunteer
Myall Dainty Flower ..	27812	17.10.39	6	4,898	4·56	223·31	350	Mature	232 ..	Myall Dainty Lad
Myall Golden Bell ..	41201	6.10.39	5	5,993	4·00	239·77	350	Mature	218 ..	Myall Dainty Lad
Grovelea Golden Belle ..	Vol. 27	5.12.39	5	3,663	4·50	164·89	230	Jr. 2	.. ..	Kenlock Golden Monarch
Myall Lady May ..	34026	25.9.39	5	5,807	4·00	232·12	350	Mature	.. ..	Myall Dainty Lad
Preston Dawn Maid ..	45759	8.10.39	7	5,159	4·99	257·50	350	Mature	261 ..	Kyora Mayflower's Fancy
Warragul High School, Warragul, Red Poll (5).										
‡Gipps Fleta	5810A	23.10.39	4	4,770	4·39	209·19	290	Sr. 3	253 ..	Blackwood Butler
†Gipps Lady Rosalind ..	4628A	11.12.39	4	4,290	4·35	186·45	330	Sr. 4	189, 251 ..	Blackwood Butler
Gipps Lisa	5814A	13.11.39	7	4,298	3·81	163·92	250	Sr. 2	.. ..	Naranghi Wizard
‡Gipps Winga	7128A	11.10.39	4	4,875	4·28	235·11	350	Mature	113, 202, 252, 282	Blackwood Butler
‡Gipps Yum Yum ..	5821A	8.11.39	4	5,100	4·42	238·54	310	Jr. 4	248 ..	Blackwood Butler

* 180 days in test. † 210 days in days in test. ‡ 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Waterhouse, H. W. and Son, Packenham, Jersey (13).										
Navuloa Grandmaster's Madge	63359	1.10.39	17	6,609	5·78	381·82	270	Jr. 3	.. ..	Werribee Grandmaster
Navaloa Grandmaster's Magnet	58682	18.10.39	18	9,651	5·51	531·70	310	Jr. 4	.. ..	Werribee Grandmaster
Navuloa La Madge ..	68274	19.10.39	17	5,784	6·06	350·55	230	Jr. 2	.. ..	Staghorn Laburnum's Masterpiece
Navuloa La Magnet ..	68275	14.12.39	24	5,799	6·12	354·70	230	Jr. 2	.. ..	Staghorn Laburnum's Masterpiece
Navuloa La Stralia ..	68277	4.10.39	12	7,157	5·31	380·08	230	Jr. 2	.. ..	Staghorn Laburnum's Masterpiece
Navuloa Magnetic ..	63361	1.10.39	14	8,327	5·54	460·95	270	Jr. 3	.. ..	Werribee Grandmaster
Navuloa Master's Lass ..	45406	27.10.39	11	6,272	5·22	327·21	350	Mature	.. ..	Werribee Grandmaster
Navuloa Master's Lass 3rd	58684	29.9.39	14	7,307	5·67	414·66	310	Jr. 4	.. ..	Werribee Grandmaster
Navuloa Master's Madge ..	58686	30.9.39	13	7,449	6·28	467·71	310	Jr. 4	.. ..	Werribee Grandmaster
Navuloa Master's Magnet	49805	10.10.39	22	10,109	5·09	514·94	350	Mature	.. ..	Werribee Grandmaster
Navuloa Master's Princess	49807	20.10.39	18	7,985	5·26	419·72	350	Mature	.. ..	Werribee Grandmaster
Navuloa Master's Rosebud	63366	11.10.39	16	8,568	5·50	471·56	270	Jr. 3	.. ..	Werribee Grandmaster
Navuloa Master's Stralia ..	49808	19.10.39	21	8,852	5·13	454·48	350	Mature	.. ..	Werribee Grandmaster
Watson, K. E., Gembrook, Jersey (7).										
Arranmore Golden Dream	C.R.	29.11.39	8	3,251	5·47	177·73	230	Jr. 2	.. ..	Glen Iris Golden Dreamer
Goronga Farm Aviette ..	66742	30.9.39	9	5,230	5·47	285·85	310	Jr. 4	228 ..	Somerville Reputed King
Goronga Farm Daffodil's Flight	C.R.	24.12.39	13	4,316	5·48	236·41	290	Sr. 3	.. ..	Werribee Alanda
Goronga Farm Empress Daffodil	66743	26.11.39	20	7,117	5·01	356·39	330	Sr. 4	199 ..	Somerville Reputed King
Goronga Farm Jester's Pearl	53006	25.11.39	13	5,614	5·37	301·64	350	Mature	317, 345, 244	Goronga Farm Jester
Goronga Farm Soubrette ..	61927	25.12.39	19	5,414	5·26	284·89	310	Jr. 4	233 ..	Somerville Reputed King
Goronga Farm Star Turn ..	61928	28.10.39	4	4,197	6·24	261·85	310	Jr. 4	303, 230 ..	Somerville Reputed King
Whitehead, E. J. and Sons, Beaconsfield, Jersey (2).										
Selsey Champion Lotus ..	69055	26.11.39	13	4,527	5·06	228·92	230	Jr. 2	.. ..	Brampton Son of Champions (Imp.)
Selsey Sociable Miss ..	69072	24.11.39	7	4,371	6·38	278·92	230	Jr. 2	.. ..	Selsey Great Boy
Williams, F. A., Bamawm Extension, Jersey (7).										
Ballara Bonnie	33911	13.11.39	19	8,355	6·57	548·94	350	Mature	402, 565, 629, 634, 691, 615, 583, 650	Brucevale Lord Fancy Madeira
Bamawm Bonnie Lass ..	47099	10.12.39	21	7,123	6·13	436·38	350	Mature	419, 489, 461	Bamawm Leon
Bamawm Bonnie Lass 2nd	60470	4.12.39	30	11,118	6·75	750·27	350	Mature	393, 552 ..	Bamawm Leon
Bamawm Daisy Bell ..	Vol. 27	4.10.39	15	5,192	6·10	316·91	230	Jr. 2	.. ..	Bamawm Bonnie Bugler
Bamawm Fancy Gem ..	47100	27.9.39	20	8,327	5·75	478·51	350	Mature	357, 412, 490, 429	Bamawm Leon
Bamawm Fancy Gem 2nd	Vol. 27	19.10.39	20	6,937	6·01	417·04	230	Jr. 2	.. ..	Bamawm Peter Pan
Bamawm Mistress Peggy ..	56238	26.10.39	30	8,997	5·64	507·02	350	Mature	373, 422, 344	Bamawm Bonnie Boy
Wilson, A., Port Fairy, Ayrshire (7).										
Carracoorte Balm 11th ..	19679	21.10.39	8	6,774	4·37	296·34	350	Mature	388, 363, 357, 346, 373	Gerty's Producer of Carracoorte
Lough View Beauty 2nd ..	C.R.	17.10.39	10	4,703	4·13	194·09	230	Jr. 2	.. ..	Carracoorte Bobby
Lough View Brownie ..	32778	5.11.39	6	3,846	5·11	196·44	230	Jr. 2	.. ..	Carracoorte Bobby
Lough View Music ..	32779	27.8.39	8½	5,636	4·40	248·23	230	Jr. 2	.. ..	Carracoorte Bobby
Lough View Violet ..	32781	17.10.39	6½	4,872	4·00	195·02	230	Jr. 2	.. ..	Carracoorte Bobby
Rivery Park Hope ..	32985	5.11.39	4	5,849	4·26	249·05	350	Mature	.. ..	Carracoorte Lucifer
Stoneleigh Fairy 2nd ..	33031	8.10.39	8	4,802	4·21	202·03	230	Jr. 2	.. ..	Strathkellar Pride



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VOLUME XXXVIII. Parts 1—12.

INDEX.

	Page
Acquisition of Apples and Pears for 1940-41 Season	598
Advanced Register of Merit—	
Standard for Dairy Cows	427
List of Cows Qualified	451
Agricultural Lime Act—Brands Registered	72
Agricultural Policy in War-time	413
Aird, J. A.—	
The Control of Irrigation Water	326
All-Australian Pig Carcass Competitions	30
Apples and Pears—	
Acquisition Scheme for 1940–41 Season	598
Australian	111
Codling Moth and Black Spot in	383
Preservation of	14
Argentine Ant in Victoria	486
Arsenical Poisoning of Stock	597
Artificial Fertilizers Registered for 1940	22
Association Tested Cows—New Identification System	473
Australian Apples and Pears	111
"Bacchus Marsh" Subterranean Clover	108
Barbed-wire—New Standards Issued	306
Barbed-wire Wounds in Horses	110
Barraclough, B. H. E.—	
Caseous Lymphadenitis (Cheesy Gland) of Sheep	431
Bartels, L. C.—	
Grading Land for Irrigation	157
Irrigated Pastures—Species Recommended	211
Bartels, L. C. (and McKenzie, D. R.)—	
Farm Improvement Competition—Results at Phillip Island	53
Beeswax—Cleaning of	434
Berryman, G. R. (and Mess, Alex.)—	
Clean Milk and Dairy Farm Competition, Dumbalk District	233
Beruldsen, E. T.—	
Irrigated Pasture and Lucerne Competition, Maffra	269
Fodder Conservation Competition, Maffra District, 1940	341
Black Spot and Codling Moth	383
Bloat or Hoven in Cattle	538
Blood and Meat Spots in Eggs	544
Bracken Fern	465
Brake, J.—	
Erosion Control—Importance of Vegetative Cover	173
Breeding of Wheat	1
Breeding of Pigs	80
Burnley Egg-laying Competition—	
Results, 1939–40	181
Results, 1940–41	506
1939–40 Prize List	Supp. April
Burnley Egg-laying Competition	246
Butter and Lamb Prices	600
Candying Citrus Peels	75
Care of Horses' Teeth	560
Caseous Lymphadenitis (Cheesy Gland) of Sheep	431
Cattle—	
Cattle Breeding Act	49
Grass Tetany in Cows	498
Hoven or Bloat in	538
Tuberculosis in Stock	26
"Victoria" Friesian Stud—New Sire imported	168
Cereals—	
Mallee Research Station—Experiments and Results	523
Oats for Grazing	101
Victorian F.A.Q. Wheat Analysis of 1940 Sample	127
Wheat Breeding	1
Wheat Crop Championships—Wimmera and Mallee Results	51
Wheat Crop and Fallow Competition—Warracknabeal, 1939	121
Zinc Requirement of Wheat	135
Cheesy Gland (Caseous Lymphadenitis) of Sheep	431
Citrus—	
Candying Citrus Peels	75
Fertilizing Citrus Trees	312
Clark, A. G. (and Pederick, W.)—	
Poultry Feeding Tests, 1939–40	398
Cleaning Beeswax	434
Clean Milk and Dairy Farm Competition—Dumbalk	233
Clinton, H. F.—	
Table Poultry Production	69
Burnley Egg-laying Competition—	
Results, 1939–40	181
Results, 1940–41	506
Marketing Eggs—Importance of Cleanliness	494

	Page
Clovers—	
Alsike	213
"Bacchus Marsh" Subterranean Clover	108
Clover-lay Farming	205
New Zealand Perennial Red	213
New Zealand White	213
Strawberry	213
Subterranean	213
Victorian Irrigation White	213
Cocksfoot-Seed Harvesting Methods	519
Codling Moth and Black Spot—Fourth Annual Report	383
Cod Liver Oil	376
Cole, C. E. (and Provan, J. L.)—	
Fertilizing Citrus Trees	312
Manuring Peach Trees for Profit	420
Control of Irrigation Water	326
Cool Storage of Plums	247
Cows—Grass Tetany in	498
Crops—	
Breeding of Wheat	1
Crop Championships—Wimmera and Mallee Results	51
Crop and Fallow Competition, Warracknabeal	121
Irrigated Summer Crops at Boort	261
Mallee Research Station—Experiments and Results	523
Zinc Requirement of Wheat	135
Dairying—	
A Profitable Dairy Farm	575
Advanced Register of Merit—Standard for Dairy Cows	427
Association Test Cows—Identification System	473
Clean Milk and Dairy Farm Competition—Dumbalk	233
Dairy Calves—Rearing, Feeding, Management	369
Dairy Factory Effluents	28
Grade Herd Test—Annual Report, 1939–40	509
List of Cows Qualified for Advanced Register of Merit	451
Metals Used in the Dairying Industry	332
Standard Herd Test Report, 1939–40	415
Dermatitis, Mycotic, of Sheep	574
Downey, L. A.—	
Bacon and Pork Competition	483
Pig Breeding	80
Pig Feeding	389
Pig Housing and Equipment	3
War-time Pig Production	571
Drake, E. J. (and Hepburn, E. A., and Trembath, R. H.)—	
Dairy Factory Effluents	28
Drake, F. R.—	
"Bacchus Marsh" Subterranean Clover	108
Cocksfoot—Seed Harvesting Methods	519
Lawns and Playing Grounds	321
Pasture Improvement Competition—Coleraine	580
Echuca and District Irrigated Pasture and Lucerne Competitions	285
Eelworm on Potatoes	499
Egg-laying Competition, Burnley—	
Results, 1939–40	181
Results, 1940–41	506
Egg-laying Competition, Burnley	246
Egg-laying Competition, Burnley—Prize List	Supp. April
Eggs, Marketing of—Importance of Cleanliness	494

	Page
Elder, H. M.—	
Hypocalcaemia or Milk Fever in Ewes	388
Photo-sensitization in Sheep and Lambs	466
Pregnancy Toxaemia of Sheep	401
Entomology—	
Argentine Ant	486
Codling Moth	383
Eelworm	499
Grasshopper	275
Insect Pests of Tomatoes	140
Meadow Nematode	411
Potato Moth	236
Sheep Ked	579
Wheat Weevil	517
Erosion Control—	
Importance of Vegetative Cover	173
Holding the soil on Cultivated Lands	257
Fallow and Wheat Crop Competition—Warracknabeal	121
F.A.Q. Wheat Sample—Analysis of	127
Farmer and the War	461
Farm Improvement Competition—Results at Phillip Island	53
Feeding of Pigs	389
Feeding of Sheep	581
Ferguson, K. V. M.—	
Tree Windbreaks on the Farm	266
Fertilizers (Artificial)—	
Agricultural Lime Act—Brands Registered for 1940	22
Analyses and Unit Values	Supp. Jan.
Inspections under Fertilizer Act	438
Prosecution	365
Result of Appeal	232
Fertilizing Citrus Trees	312
Flax—	
A Drive for Increased Production	309
Harvesting Fibre	467
Sowing for Fibre	165
Flower Garden—	
Camellia	447
Daffodils	77
Dahlia	33, 495
Deciduous Plants	404
Flowering Fruit Trees	352
Lawn Grasses	137, 321
Pansy	601
Primula	193
Roses	303
Salvia	547
Fodder Conservation Competition—	
Maffra District, 1940	341
Pyramid Hill	533
Fodder, Pasture Seeds—Imported	414
Forster, H. C.—	
Erosion Control—Holding Soil on Cultivated Lands	257
Friesian Stud—"Victoria"	168
Fruit—	
Australian Apples and Pears	111
Candying Citrus Peels	75
Cool Storage of Plums	247
Diseases and Pests—Codling Moth and Black Spot	383
Fertilizing Citrus Trees	312
Invigorating Fruit Trees by Inarching	366
Manuring Fruit Trees for Profit	420
Preservation of Apples and Pears	14

Page

Fungicides Act 194
Fungicides, Insecticides—Registered Supp. April
Galvanized Barbed-wire—New Standards Issued 306
Garden Notes .. 33, 77, 137, 193, 255, 303, 352 404, 447, 495, 545, 601
Gayford, G. W.—
Orchard Green Manuring 129
Grade Herd Test—Annual Report for 1939–40 .. 509
Grading Land for Irrigation 157
Grasshopper Pest 275
Grass Tetany in Cows 498
Grayson, A. R.—
Hoven or Bloat in Cattle 538
Lamb Marking 229
Sheep Husbandry—It's relation to Disease Control 361
Toxaemic Jaundice of Sheep 349
Greatorex, F. J. (and Provan, J. L.)—
Invigorating Fruit Trees by Inarching .. 366
Green Manuring in the Orchard 129
Grooming of Horses 354
Harvesting Fibre Flax 467
Harvesting Tomatoes 60
Hayman, R. H. (and Morrow, J. A.)—
Clover-lay Farming 205
Hepburn, E. A. (and Drake, E. J., and Trembath, R. H.)—
Dairy Factory Effluents 28
Herd Test—Grade—Annual Report, 1939–40 .. 509
Herd Records—Standard .. Supps. March, June, Sept., Dec.
Hewitt, A. C. T.—
Dairy Calves—Rearing, Feeding, Management 369
Feeding of Sheep 581
Live-stock Notes 189, 243, 291, 345, 395, 435, 500, 541, 593
"Victoria" Friesian Stud—New Sire Imported 168
Hogan, E. J.—
The Farmer and the War 461
Hogan, T. W.—
The Argentine Ant in Victoria 486
Hore, H. L.—
Sand Drift and Control Measures 219
Hore, H. L. (and Sims, H. J., and Webb, C. G.)—
Mallee Research Station—Experiments and Results 523
Horses—
Barbed-wire Wounds in 110
Care of Teeth 560
Grooming of Horses 354
Watering Horses 445
Huelin, F. E. (and Tindale, G. B.)—
Cool Storage of Plums 247
Hypocalcaemia or Milk Fever in Ewes .. 388
Identification System for Association Tested Cows 473
Imported Sire for "Victoria" Friesian Stud .. 168
Imported Pasture, Fodder, and Vegetable Seeds 414
Inarching—Invigorating Fruit Trees .. 366
Insecticides, Fungicides—Registered Supp. April
Insect Pests—See Entomology
Insect Pests of Tomatoes 140
Inspections Under the Fertilizer Act .. 438
Invigorating Fruit Trees by Inarching .. 366

Page

Irrigation—
Control of Irrigation Water 326
Grading Land for Irrigation 157
Irrigated Pasture and Lucerne Competition, Maffra 269
Irrigated Pastures—Species Recommended .. 211
Irrigated Summer Crops at Boort 261
Soil Changes under Irrigated Pasture .. 83
Jessep, A. W.—
Garden Notes—See Garden Notes.
Jewell, W. R.—
Metals Used in the Dairying Industry .. 332
Ked, The Sheep 579
Knight, Miss A.—
Candying Citrus Peels 75
Krone, B. P.—
Harvesting Tomatoes 60
Saving Tomato Seed 268
Tomatoes Recommended for the Home Garden 405
Lamb and Butter Prices 600
Lamb Marking 229
Lambs, Photo-sensitization in Sheep and .. 466
Lancaster, J. (and A. Mess.)—
A Profitable Dairy Farm 575
Lang, W. R.—
Scientific Aids to the Breeder and Pastoralist 424
Lawns and Playing Grounds 321
Lawn Grasses 137
Leaf Scorch of Narcissus 307
Lee, A. A.—
Harvesting Fibre Flax 467
Sowing Flax for Fibre 165
Lerew, W. M.—
Arsenical Poisoning of Stock 597
Tuberculosis in Stock 26
Lime—Brands Registered for 1940 72
List of Cows Qualified for Advanced Register of Merit 451
Live-stock Notes .. 189, 243, 291, 345, 395, 435, 500, 541, 593
Lucerne—
Irrigated Pasture and Lucerne Competition, Maffra 269
Mallee Research Station—Experiments and Results 523
Manurial Trials—Potatoes 237
Manuring Orchard—Green 129
Manuring Peach Trees for Profit 420
Marginal Areas Grant 260
Marketing Eggs—Importance of Cleanliness .. 494
Marketing Primary Products—Amendments to Act 463
Mattingley, G. H.—
Potato Manurial Trials—Results, 1939–40 .. 237
McCarthy, T.—
The Grasshopper Pest 275
McDonald, W. J. B.—
Flax—A Drive for Increased Production .. 309
McKenzie, D. R. (and Bartels, L. C.)—
Farm Improvement Competition—Phillip Island Results 53
McKeon, B. F.—
Warracknabeal Wheat Crop and Fallow Competition, 1939 121
Meadow Nematode 411
Meat We Eat 504
Mess, Alex. (and Berryman, G. R.)—
Clean Milk and Dairy Farm Competition, Dumbalk District 233

Page

Mess, Alex. (and Lancaster, J.)—
A Profitable Dairy Farm 575
Metals Used in the Dairying Industry .. 332
Milk Fever in Ewes—Hypocalcaemia .. 388
Milk—Clean Milk Competitions 233
Millikan, C. R.—
Leaf Scorch of Narcissus 307
Meadow Nematode 411
Sugar-beet Diseases—Progress Report .. 35
Zinc Requirement of Wheat—Effect of Superphosphate 135
Morgan, A.—
Fodder Conservation Competition—Pyramid Hill 533
Irrigated Summer Crops at Boort 261
Rochester Pasture Competition—Results, 1939–40 315
Morrow, J. A. (and Hayman, R. H.)—
Clover-lay Farming 205
Mountjoy, S. A.—
Worms in Sheep 377
Mullett, H. A.—
Primary Production and the War 153
Mycotic Dermatitis of Sheep 574
Nematode—Meadow 411
Oats—
Oats for Grazing—Mallee Results 101
Orchard—
Orchard Green Manuring—Results of Tests .. 129
Monthly Notes .. 32, 78, 138, 192, 254, 304, 351, 403, 449, 496, 545, 602
Pastures—
Clover-lay Farming 205
Cocksfoot—Seed Harvesting Methods .. 519
Erosion Control—Importance of Vegetative Cover 173
Fodder Conservation Competition, Maffra District, 1940 341
Imported Pasture, Fodder, and Vegetable Seeds 414
Irrigated Pasture and Lucerne Competition, Maffra 269
Irrigated Pastures—Species Recommended .. 211
Irrigated Summer Crops at Boort 261
Meadow Nematode 411
Pasture Improvement Competition—Coleraine 580
Pasture Investigations—Results of 1939 Trials 561
Rochester Pasture Competition—Results, 1939–40 315
Soil Changes under Irrigated Pasture .. 83
Trials—
Irrigation—
Boort 261
Echuca and District 285
Maffra 269
Werribee 83
Manurial—
Caldermeade 570
Cobden 609
Cobrico 609
Colac West 611
Cudgee 608
Glenormiston North 608
Korumburra 604
Lardner 605
Larpent 607, 611
Mirboo North 606
Warragul 604, 605

Page

Peach Trees—Manuring for Profit 420
Pears and Apples—
Acquisition Scheme for 1940–41 Season .. 598
Preservation of 14
Pears—Codling Moth and Black Spot in .. 383
Pederick, W. O. (and Clark, A. G.)—
Poultry Feeding Tests, 1939–40 398
Penman, F.—
Soil Changes Under Irrigated Pasture .. 83
Pescott, R. T. M.—
Insect Pests of Tomatoes 140
Potato Moth Attacks Tomatoes 236
Weevil Damage to Stored Grain 517
Photo-sensitization in Sheep and Lambs .. 466
Phylloxera Resistant Vines 267
Piele, Miss R.—
Preservation of Apples and Pears 14
Pigs—
Bacon and Pork Pig Competition 483
Carcass Competitions 30
Pig Breeding 80
Pig Feeding 389
Pig Housing and Equipment 3
Pig Production in War-time 571
Planting of Early Potatoes 376
Plums—Cool Storage of 247
Poisoning of Stock—Arsenical 597
Potatoes—
Eelworm on Potatoes 499
Planting of Early Potatoes 376
Potato Manurial Trials—Results for 1939–40 237
Potato Moth Attacks Tomatoes 236
Raising Standard of Potato Stocks .. 479
Poultry—
Egg-laying Competitions 181, 246, 506, Supp. April
Poultry Feeding Tests, 1939–40 398
Table Poultry Production 69
Pregnancy Toxaemia of Sheep 401
Preservation of Apples and Pears 14
Primary Production and the War 153
Primary Products, Marketing of 463
Profitable Dairy Farm 575
Provan, J. L.—
Orchard Notes—See Orchard Notes.
Provan, J. L. (and Cole, C. E.)—
Fertilizing Citrus Trees 312
Provan, J. L. (and Greatorex, F. J.)—
Invigorating Fruit Trees by Inarching .. 366
Pyramid Hill Fodder Conservation Competition 533
Questions and Answers 136, 191, 218, 274, 320, 397
Quinn, D. G.—
Sulphur Dioxide—Its Use in the Wine Industry 200
Raising the Standard of Potato Stocks .. 479
Ramsay, J. T.—
Raising the Standard of Potato Stocks .. 479
Raw, A. R.—
Wheat Breeding—Progress and Development 1
Rayner, G. B.—
Echuca and District Irrigated Lucerne and Pasture Competition 285
Registered Fungicides, Insecticides, &c. Supp. April
Registration of Stallions—Twentieth Annual Report 239

Page

Robertson, W. C.—
Agricultural Lime Act—Brands Registered for 1940 72
Artificial Fertilizers Registered for 1940 .. 22
Fungicides Act 194
Inspections Under the Fertilizer Act .. 438

Rochester Pasture Competition—Results for 1939-40 315

Rubber-growing in Sumatra 295

Sand Drift and Control Measures 219

Saving Tomato Seed 268

Scientific Aids to the Breeder and Pastoralist .. 424

Shattock, H.—
Victorian F.A.Q. Wheat—Analysis of 1940 Sample 127

Shew, W. D.—
Grooming of Horses 354
Mycotic Dermatitis of Sheep 574
The Meat We Eat 504

Sheep—
Arsenical Poisoning of Stock 597
Caseous Lymphadenitis (Cheesy Gland) of Sheep 431
Feeding of Sheep 581
Hypocalcaemia or Milk Fever in Ewes .. 388
Lamb Marking 229
Mycotic Dermatitis in Sheep 574
Photo-sensitization in Sheep and Lambs .. 466
Pregnancy Toxaemia of Sheep 401
Scientific Aids for Breeder and Pastoralist .. 424
Sheep Husbandry—Its Relation to Disease Control 361
The Sheep Ked 579
Toxaemic Jaundice of Sheep 349
Worms in Sheep 377

Sims, H. J. (and Hore, H. L., and Webb, C. G.)—
Mallee Research Station—Experiments and Results 523

Sims, H. J.—
Oats for Grazing—Mallee Results 101

Sjogren, N.—
Grass Tetany in Cows 498

Soil Changes under Irrigated Pasture .. 83

Soil Drift Control—Conditions of Competition 460

Sowing Flax for Fibre 165

Stallions—Registration—Twentieth Annual Report 239

Standard Herd Records .. Supp. March, June, Sept., Dec.

Standard Herd Test, 1939-40—Record Average Yield 415

Stock—
Arsenical Poisoning of 597
Barbed Wire Wounds in Horses 110
Care of Horses' Teeth 560
Dairy Calves—Rearing, Feeding, and Management 369
Feeding of Sheep 581
Grass Tetany in Cows 498
Grooming of Horses 354
Hoven or Bloat in Cattle 538
Lamb Marking 229
Pig Breeding 80

Stock—*continued.*. Page
Pig Feeding 389
Pig Housing and Equipment 3
Scientific Aids to Breeder and Pastoralist .. 424
War-time Pig Production 571
Watering Horses 445
"Victoria" Stud—New Sire Imported .. 168
Diseases and Pests—
Caseous Lymphadenitis (Cheesy Gland) of Sheep 431
Hypocalcaemia or Milk Fever in Ewes .. 388
Mycotic Dermatitis of Sheep 574
Photo-sensitization in Sheep and Lambs .. 466
Pregnancy Toxaemia of Sheep 401
Sheep Husbandry—Its Relation to Disease Control 361
Sheep Ked 579
Toxaemic Jaundice of Sheep 349
Tuberculosis in Stock 26
Worms in Sheep 377

Subterranean Clover "Bacchus Marsh" .. 108

Sugar-beet Diseases 35

Sulphur Dioxide—Its Use in the Wine Industry 200

Table Poultry Production 69

Talbot, R. J. de C.—
Registration of Stallions—Twentieth Annual Report 239

Talks for Farmers 21

Tetany, Grass, in Cows 498

Tindale, G. B. (and Huelin, F. E.)—
The Cool Storage of Plums 247

Tomatoes—
Harvesting of Tomatoes 60
Insect Pests 140
Potato Moth Attacks Tomatoes 236
Saving Tomato Seed 268
Tomatoes Recommended for the Home Garden 405
Varieties in Victoria .. .. Supp. March

Toxaemic Jaundice of Sheep 349

Toxaemia of Sheep—Pregnancy 401

Tree Windbreaks on the Farm 266

Trembath, R. H. (and Drake, E. J., and Hepburn, E. A.)—
Dairy Factory Effluents 28

Tubercle Free Herds Supp. Jan., April, 350, 410, 478, 560, 612

Tuberculosis in Stock 26

Twentyman, R. L.—
Pasture Investigations—Results of 1939 Trials 561

Vegetable Garden—See Garden Notes.

Vegetable Seeds—Imported 414

Victorian F.A.Q. Wheat—Analysis of 1940 Sample 127

"Victoria" Friesian Stud—New Sire Imported 168

War-time Agricultural Policy 413

War-time Pig Production 571

Ward, J. M.—
Australian Apples and Pears 111

Warracknabeal Wheat Crop and Fallow Competition 121

Watering Horses 445

Weevil Damage to Stored Grain 517

	Page
Webb, C. G. (and Hore, H. L., and Sims, H. J.)—	
Mallee Research Station—Experiments and Results	523
Wheat—	
Breeding and Development	1
Crop Championships—Wimmera and Mallee Results	51
Crop and Fallow Competition, Warracknabeal	121
Mallee Research Station—Experiments and Results	523
Victorian F.A.Q. Wheat Analysis of 1940 Sample	127
Weevil Damage to Stored Grain	517
Zinc Requirement of Wheat	135
Windbreaks on the Farm	266
Wireless Talks for Farmers	21, 305
Women's Auxiliary Training League	152
Worms in Sheep	377
Young Farmer's Broadcast	253
Yuill, W. J.—	
Advanced Register of Merit—Standard for Dairy Cows	427
Association Test Cows—New Identification System	473
Grade Herd Test—Annual Report, 1939–40	509
Standard Herd Test, 1939–40—Record Average Yield	415
Zinc Requirement of Wheat—Effect of Superphosphate	135

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